THE REVIEW
OF
APPLIED MYCOLOGY

Vol. VII

ISSUED BY THE IMPERIAL
BUREAU OF MYCOLOGY

THE IMPERIAL BUREAU OF MYCOLOGY
KEW, SURREY

1928

IMPERIAL BUREAU OF MYCOLOGY.

Honorary Committee of Management.

ERRATA

Page 40	line 45 insert ‘*Tech.*’ before ‘*Bull.*’			
68	31	for ‘holzzerstrender’	read	‘holzzerstörender’
110	39	,, ‘1927’	,,	‘1926’
153	36	,, ‘tillantin’	,,	‘tillantin C’
169	45	,, ‘*interdigitalis*’	,,	‘*interdigitale*’
215	1	,, ‘Stapp (E.).’	,,	‘Stapp (C.).’
218	1	,, ‘Nicolas (C.).’	,,	‘Nicolas (G.).’
229	34	,, ‘uniseptate’	,,	‘unseptate’
338	36	,, ‘*Himatoglossum*’	,,	‘*Himantoglossum*’
350	5	,, ‘*nuessleini*’	,,	‘*nuesslini*’
427	39	,, ‘*fici-carici*’	,,	‘*fici-caricae*’
515	20	,, ‘loc. cit.’	,,	‘ibid., v, p. 558’
531	30	,, ‘*zeae*’	,,	‘*maydis*’
534	47	,, ‘*Alernartia*’	,,	‘*Alternaria*’
548	47	,, ‘Бьлгарня’	,,	‘Бьлгария’
563	42	,, ‘565’	,,	‘226’
574	49	,, ‘ridzę’	,,	‘rdzę’
618	21	,, ‘*ribes-caricis*’	,,	‘*ribesii-caricis*’
682	29	,, ‘1’	,,	‘2’
687	2	,, ‘*caliciformis*’	,,	‘*calyciformis*’
690	46	,, ‘manelite’	,,	‘malenite’
711	51	,, ‘399’	,,	‘231’
741	50	insert ‘979’ after ‘P.O.J.’		
745	36	for ‘*lopantha*’	read	‘*lophantha*’
745	46	,, ‘paint’	,,	‘paints’
752	lines 31 and 38, for ‘*Plant Protect.*’ read ‘*Agric.*’			

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

APPLIED MYCOLOGY

VOL. VII JANUARY 1928

LINFORD (M. B.) & SPRAGUE (R.). **Species of Ascochyta parasitic on the Pea.**—*Phytopath.*, xvii, 6, pp. 381–397, 2 pl., 2 graphs, 1927.

In this paper the authors compare three types of *Ascochyta* isolated from two classes of leaf spots and foot rot of peas in Wisconsin, as well as from diseased seed. Of the two types of leaf spot observed, the light type of spotting is characterized by a circular, tan spot, sometimes whitish at the centre, with a distinct dark brown margin, and with amber to brown pycnidia towards the centre. On stems, petioles, and pedicels the lesions are oval or elongated, and so deep that the affected part may be almost severed. The pods may be penetrated by the fungus, and the peas discoloured by deep, circular, tan pits with prominent dark margins.

The dark type of spotting is readily distinguishable from the foregoing by the zonate arrangement of the dark brown, chocolate, or purplish-brown spots, which are generally darkest in the centre, shading towards pale greyish-brown at the periphery. On stems, petioles, and pods the dark spotting is commonly more superficial and diffuse than the light. Stem lesions occur near the ground and at the nodes, sometimes extending over considerable areas and producing a dark or purplish-brown discoloration of the cortical tissue. The formation of pycnidia is quite erratic in this type of spotting.

The fungus proved by inoculation experiments to cause the light spotting was identified as the true *Ascochyta pisi* Lib. The dark spotting is attributed to the true pycnidial stage of *Mycosphaerella pinodes* and a 'micro' form of the same species, both of which are also responsible for foot rot [*R.A.M.*, v, p. 590]. Formerly both the light and the dark leaf spotting fungi were listed under *A. pisi*, but the descriptions of *A. pisi* usually given (e. g., that of Saccardo) are based on the light type of spotting. *A. pisicola* Berk. is stated to be a synonym of this species. Both light and dark spotting were present in Europe as early as 1895. Stone and Vaughan (*Phytopath.*, iii, p. 71, 1913) apparently established *M. pinodes* as the ascigerous stage of *A. pisi*, but the authors consider the work to have been done with the dark spotting species and not with the

true *A. pisi* [*R.A.M.*, vi, p. 456]. Emended descriptions of all these fungi are given.

The pycnidia of the true *A. pisi* are gregarious at the centre of the spots, and measure 75 to 225 μ, the pycnospores are somewhat constricted and 10 to 14 by 3 to 5 μ. The pycnidial stage of *M. pinodes* is found scattered over the dark brown spots, and measures 67 to 175 μ; the pycnospores are relatively plump and distinctly constricted, containing conspicuous oil globules; they measure 12 to 17 by 3·5 to 5·5 μ. The suspected 'micro' form of *M. pinodes* is similar to the last, but has spores usually non-septate and 5 to 11 by 2·5 to 4·5 μ, or uni-septate and 8 to 12 by 3 to 4·5 μ. Chlamydospores are developed in some of the more intensely black cultures of the 'micro' fungus producing few pycnidia. They may be small, citron-shaped, continuous or uniseptate, and olivaceous, or large, fusiform, oval, or spherical, borne apically, sometimes in chains, and composed of one to three cells.

Inoculation studies and field observations indicated that *M. pinodes* is a more serious pathogen than *A. pisi*, and it seems to have been the cause of the more severe outbreaks of disease on peas reported in literature.

All three fungi were shown to be carried on the seed, *A. pisi* being most prevalent on the samples tested in 1926. In one season's plot trials, seed infested with these organisms gave poorer stands than clean seed, but resulted in no considerable incidence of foot rot or leaf spot. Field observations indicate that *M. pinodes* survives Wisconsin winter conditions better than *A. pisi*, while the 'micro' form may persist in the soil for two years between crops of peas. The occurrence of *A. pisi* is more closely connected with the use of diseased seed. From 1924 to 1926, inclusive, the diseases caused by species of *Ascochyta* were of minor importance in Wisconsin pea culture.

HARTER (L. L.) & WHITNEY (W. A.). **A transit disease of Snap Beans caused by Pythium aphanidermatum.**—*Journ. Agric. Res.*, xxxiv, 5, pp. 443–447, 1 pl., 1927.

A brief account is given of a soft, watery rot which was observed in the spring of 1925 and the warm months of 1926 to attack parcels of snap beans (*Phaseolus vulgaris*) forwarded by rail from Florida. The beans were overrun with a cottony growth of mycelium, suggestive at first sight of *Sclerotinia sclerotiorum* [*R.A.M.*, v, p. 269], but differing from the latter in the absence of sclerotia and in its fine, fluffy, almost pure white and more abundant growth. On isolation the organism was identified as *Pythium aphanidermatum*, shown by Drechsler to be the cause of the 'cottony leak' of cucumbers and eggplants [ibid., v, pp. 71, 465], and the authors suggest the same name for this rot of the beans, to distinguish it from that caused by *S. sclerotiorum*.

Parallel inoculation experiments made with *P. aphanidermatum*, *S. sclerotiorum*, *Rhizoctonia solani*, *Botrytis cinerea*, *Rhizopus tritici*, and *R. nigricans* showed that the first-named causes a more rapid decay of the beans than the other organisms. A similar rot was also produced by *P. ultimum* from cabbage and sweet potato, *P. splendens* from *Pelargonium* sp., and *P. myriotylum* Drechsler

(unpublished) from cucumber, but none of the species of *Pythium* with spiny oogonia which were tested was found to be parasitic. One isolation of *P. de Baryanum* from peas caused some decay when inoculated into a wound, but was unable to attack sound tissue.

In regard to control, it is recommended that the beans should be carefully graded before packing, and all those that show any blemishes or disease lesions should be discarded, as there is evidence that the disease originates in the field on beans resting on or partly covered by the soil. The beans should be gathered in a dry condition and kept in a cool, dry place until dispatched. The consignments should be stored in conditions allowing the maximum amount of ventilation and refrigeration.

MOLZ (E.). **Root-burn of Sugar Beet.**—*Zuckerrübenbau*, ix, pp. 33–39, 1927. [Abs. in *Chem. Abstracts*, xxi, 14, p. 2395, 1927.]

The absence of useful results from the disinfection of beet seed [against root rot associated with *Phoma betae, Pythium de Baryanum,* and *Aphanomyces levis*] with betanal, germisan, &c., is ascribed to excessive acidity of the soil.

CARTER (W.). **A technic for use with homopterous vectors of plant disease, with special reference to the Sugar-Beet leaf hopper, Eutettix tenellus (Baker).**—*Journ. Agric. Res.*, xxxiv, 5, pp. 449–451, 1 fig., 1927.

A very brief description is given of an apparatus devised by the author for the artificial feeding of homopterous vectors of plant diseases in the course of his studies of the relationship between the sugar beet leafhopper (*Eutettix tenella*) and curly top of sugar beet. Essentially it consists of a container prepared from an animal mesentery ('fish-skin') into which the food solution is poured and which is then placed in a glass cylinder in which the insects are caged. The insects are stated to have been repeatedly observed to feed through this membrane.

This apparatus is claimed to open a wide range of possibilities, particularly with regard to the study of the properties of the virus carried by the insect. The author also claims to have been able by this method to produce curly top of beet from the juice of diseased beets which was thus fed to non-infective insects and transmitted by them to healthy beets. Similar results are stated to have also been obtained by Severin at the California Agricultural Experiment Station.

FAWCETT (G. L.). **The curly top of Sugar Beet in the Argentine.**—*Phytopath.*, xvii, 6, pp. 407–408, 1927.

In this paper the writer repeats the statement already made [*R.A.M.*, vi, p. 602] to the effect that curly top of sugar beet in the Argentine is transmitted by *Agallia sticticollis* (previously referred to as *Aceratogallia sanguinolenta*), and not by *Eutettix tenella*. Careful search for the latter insect failed to reveal its presence in Tucumán, while further experiments conducted under controlled conditions have established beyond all doubt that *A. sticticollis* is the vector of the disease.

KENDRICK (J. B.). **The black-root disease of Radish.**—*Purdue Agric. Exper. Stat. Bull.* 311, 32 pp., 13 pl., 1927.

Black root disease of radishes [*R.A.M.*, iv, p. 83] is stated to have caused serious damage to the long, white varieties in Indiana, many market-gardeners having reported the loss of their entire crop.

The causal fungus, a technical description of which is given in English, is considered by the author to be a new species of *Aphanomyces*, for which he has already proposed the name *A. raphani* [ibid., vi, p. 455]. It produced, when grown on potato dextrose agar, a white, prostrate, mycelial mat which developed best at 23° to 27° C. but made some growth at all temperatures between 12° and 30°. The hyphae vary from 8·2 to 11·3 μ in diameter, with an average of 9·2 μ. The sporangia are terminal or intercalary, much branched, and spirally twisted at the apex of the discharging branches, of which there may be several to each sporangium. The zoospores are at first cylindrical and measure between 6·9 and 26 μ in length; after emergence they become spherical and are from 8·8 to 12·7 μ in diameter. Diplanetism occurs from two to six hours after discharge.

The oogonia are globose, from 32 to 44·9 μ in diameter (average 37·4 μ); the antheridia are club-shaped and arise either from an unbranched stalk or from one with one to three (usually two) antheridial branches which lie flat on the surface of the oogonium. The oospores are single, globose, from 21·4 to 29·8 μ in diameter (average 25·7 μ), and with a hyaline wall from 2·5 to 4·5 μ thick.

The fungus usually enters the host at the natural wounds made where the secondary roots emerge from the primary one. The hyphae are intercellular and form dark brown masses in the intercellular spaces, causing also a brown discoloration of the adjacent cell walls. Oospores are occasionally formed in the outer tissues.

Greenhouse inoculations and field test plots proved the pathogenicity of the causal fungus, which overwinters in the ground and may be spread by infected soil. Of 30 varieties of radish tested, White Chinese alone showed any fairly consistent resistance. Aerial infection of the hypocotyl, petioles, and leaves was obtained by artificial inoculation. No other host than the radish has, so far, been found.

The only control measures suggested consist in early planting to avoid the high soil temperature favourable to the growth of the fungus, and in the use of the Red Globe varieties of radish, which often escape serious injury.

BIRMINGHAM (W. A.). **Anthracnose of Lettuce.**—*Agric. Gaz. New South Wales*, xxxviii, 6, pp. 487–490, 1 pl., 1927.

A very brief, popular account is given of an anthracnose of lettuce caused by *Marssonina panattoniana* [*R.A.M.*, iii, p. 9], which was found in 1926 in the Goulburn district of New South Wales. This constitutes, as far as the author is aware, the first record of its occurrence in that State, though it was recorded from Victoria in 1919, introduced from the United States. The present paper also discusses the economic importance of the disease, and gives the usual recommendations for its control.

NICOLAS (G.) & AGGÉRY (Mlle). **Une maladie bactérienne de l'Épinard.** [A bacterial disease of Spinach.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 2, pp. 121–141, 1 pl., 13 figs., 1927.

During the winter of 1926–7, a disease, somewhat resembling mosaic in appearance, caused much damage to spinach in the market-gardens round Toulouse. The first symptoms of the disease appear in the oldest leaves as small, well-defined, light green spots which may occur at the tip, at the edge, or scattered over the lamina. Infected leaves turn yellow and the discoloration gradually extends to the base of the petiole, whence the collar and growing point of the plant are invaded. In most cases the plants are ultimately killed. Sometimes the older leaves become rigid, brittle, and rather thicker than normal. Leaves which are infected when very young remain small, wrinkled, and resemble somewhat [potato] leaves attacked by frisolée.

Masses of bacteria of various types were found in the affected parenchyma and veins. Isolations made on various media yielded consistently a number of different bacteria, indicating, in the opinion of the authors, that the disease is associated with several kinds of bacteria and is not due to one single organism. The bacteria isolated are Gram-negative and liquefy gelatine but were not identified. The authors succeeded in reproducing the disease experimentally by inoculations with infected tissues or with cultures. They also showed that the normal mode of penetration was through the stomata. For the control of the disease, disinfection of the soil with formalin (10 l. of 2·5 per cent. solution for each square metre) and burning of diseased plants are recommended.

GO. **Krankheiten und Schädlinge des Spargels und ihre Bekämpfung.** [Diseases and pests of Asparagus and their control.]—*Obst- und Gemüsebau*, lxxiii, 11, p. 165, 1927.

A brief, popular account is given of the symptoms and life-history of the causal organism of asparagus rust (*Puccinia asparagi*) [*R.A.M.*, v, p. 532], which in Germany develops early in the year on one- to two-year-old plants and on the weaker shoots of older ones. Affected plants turn yellow and fail to assimilate the necessary reserves of nutrient substances for the formation of the next year's shoots. Control of this disease is very difficult though, according to some reports, prophylactic treatment with Bordeaux mixture is efficacious. Cultural measures likely to reduce the incidence of infection are the timely destruction of all diseased material, suitably wide spacing of the rows, and deep ploughing in the autumn.

CUNNINGHAM (G. H.). **Fungus disease attacking Artichokes. Incidence, life-history, and remedial treatment.**—*New Zealand Journ. of Agric.*, xxxiv, 6, pp. 402–408, 3 figs., 1927.

A brief account is given of a serious disease of the Jerusalem artichoke (*Helianthus tuberosus*) in New Zealand, in areas where the crop is grown for several years consecutively on the same soil. The first symptom, usually in late spring or early summer, is a wilting of the foliage, which becomes black and the whole plant is rapidly killed. The initial centre of infection, which generally

includes but a few plants, gradually increases in size throughout the season, until in the late autumn it may have spread over an extent of one-third of an acre or even more. The diseased stems show the presence, usually near ground-level but often a foot or more above the soil, of a dense white or light-coloured mycelium extending for a considerable distance, with numerous black sclerotia embedded in the underlying dead tissues. The causal organism was identified as *Sclerotinia sclerotiorum*, which has been proved to be one of the most serious fungous diseases in New Zealand, where it attacks a large number of field, orchard, and garden plants [a list of which is given]. A comparison of published descriptions leads the author to consider that *S. sclerotiorum* is identical with *S. intermedia*, *S. minor*, and *S. perplexa* [*R.A.M.*, iv, p. 12; v, p. 269], the latter only differing from it in certain characters which cannot be considered as having specific value.

Control measures should consist in the abandonment of fields already infected, which should be rested under grass for at least two years. Planting of new fields should be made with disease-free tubers, as experiments to test the possibility of disinfecting diseased seed tubers gave negative results. It was shown also that pigs fed on diseased swedes, turnips, garden vegetables, and the like, spread the disease when allowed to root in artichoke fields, and manure from such pigs also carries the infection. There is evidence that the pink variety of artichoke is highly resistant to the disease, and this observation may provide another method of control.

PFÄLTZER (A. C. B.). **Het vrucht- en bladvuur van de Komkommer, Cladosporium cucumerinum, Ell. et Arth., en Corynespora melonis (Cooke), Lindau.** [The fruit blight and leaf spot of the Cucumber, *Cladosporium cucumerinum* Ell. et Arth., and *Corynespora melonis* (Cooke) Lindau.]—Thesis, University of Utrecht (Hollandia Drukkerij, Baarn), 73 pp., 5 figs., 1 graph, 1927.

The most important disease at present affecting the extensive Dutch cucumber cultivation is stated to be fruit blight (*Cladosporium cucumerinum*), the formerly devastating leaf spot (*Corynespora melonis*) having declined in virulence of recent years.

The symptoms of both diseases are described, and the morphology and taxonomy of the causal organisms discussed. The author points out that the diagnosis of *Cladosporium cucumerinum* is very similar to that of *C. herbarum*, but states that the former species may be distinguished (*a*) by its parasitism to cucumber, (*b*) by the mode of the spore lengths, which in measurements of 200 spores was about 13 μ in the former species and about 8 μ in the latter, and (*c*) by slight differences in colour on 4 per cent. saccharose, the former having a colour corresponding to No. 215 of Klincksieck's & Valette's Code des couleurs, and the latter to No. 190. *Scolecotrichum melophthorum* Prill. et Delacr. is considered to be identical with *C. cucumerinum* [*R.A.M.*, iii, p. 103], and the culture maintained under the first name at the Centraalbureau voor Schimmelcultures for 20 years proved still to be pathogenic. Both species of *Cladosporium* grew best in the laboratory at a temperature of

21° C., while the optimum for *Corynespora melonis* (with which *Cercospora melonis* is regarded as synonymous) was 25°. *Cladosporium cucumerinum* can be largely controlled by high temperatures, which is not the case with *Corynespora melonis*. The latter causes more damage in hot-houses than in frames.

The results of observations and experiments [which are fully described] showed that neither *C. melonis* nor *Cladosporium cucumerinum* is ordinarily disseminated by the seed, though the diseases may occasionally be introduced into new districts by this means. Infection by *C. cucumerinum* occurs primarily from the soil, the fungus penetrating the stem bases of seedlings and frequently destroying the entire stand. Affected stems show a dark longitudinal stripe, while dark spots, from which conidiophores develop, appear on the cotyledons. *Corynespora melonis* was not found to attack the seedlings in this manner in the author's experiments, but the possibility is not excluded. The inoculation of wounded mature cucumber stems with *Cladosporium cucumerinum* and *Corynespora melonis* gave negative results, but the persistence of the former in the lesions on the stem of seedlings that have survived the first attack provides infective material for the subsequent attack on the fruit.

A series of experiments was conducted to ascertain the effect of soil disinfection on the incidence of these diseases. The results obtained, though not altogether conclusive, indicate that great benefit may be derived from applications to the soil of formalin, germisan, or uspulun; the first-named preparation is superior to the others in the absence of adverse effects on germination.

Zöppig (F.). **Blattfleckenkrankheiten an Gurken.** [Leaf spot diseases of Cucumbers.]—*Die Kranke Pflanze*, iv, 6, pp. 96–98, 1927.

Brief descriptions are given in popular language of the following leaf spotting diseases of the cucumber occurring in Saxony, together with the usual recommendations for their control; *Corynespora mazei* [*C. melonis*], *Peronospora* [*Pseudoperonospora*] *cubensis, Gloeosporium lagenarium, Cladosporium cucumerinum, Sporodesmium mucosum*, and *Macrosporium melophthorum*.

Libutti (D.). **Attenti alla Peronospora dei Grappoli.** [Watch for the *Peronospora* on young Grape bunches.]—*L'Istria Agric.*, vii, 11, pp. 254–256, 1927.

The beneficial effect of periodic spraying and dusting in the control of downy mildew of the vine [*Plasmopara viticola*] was clearly demonstrated in Italy in 1927, the disease having been successfully checked in spite of moist conditions that were especially favourable to its development. In a few low-lying areas the vines were seriously damaged by anthracnose [*Gloeosporium ampelophagum*], but satisfactory control was obtained by painting the branches with a solution of 30 kg. iron sulphate and 5 kg. sulphuric acid in 100 litres of water.

The relation between meteorological conditions and outbreaks of downy mildew is discussed, and the importance of applying preventive sprays, followed by dusting, according to the directions

specified in a previous paper [*R.A.M.*, v, p. 650] emphasized. If the vines appear to be free from attack by *Oidium* [*Uncinula necator*] the following dusting mixture can be recommended: sulphur 40 parts, Caffaro powder 20 parts, and inert material 40 parts. Caffaro powder is stated to be also effective in the control of anthracnose.

When control has been neglected in the early stages of downy mildew, it may be necessary to employ a stronger spray mixture than the customary 1 per cent. Bordeaux. In such cases it is recommended to increase the copper sulphate from 100 to 200 gm. per 100 l. of the mixture, so as to render the latter slightly acid, or to add to every hectol. of mixture 150 gm. of ammonium chloride dissolved in 2 or 3 l. of warm water.

Krankheiten und Beschädigungen der Kulturpflanzen im Jahre 1925. [Diseases and pests of cultivated plants in the year 1925.]—*Mitt. Biol. Reichsanst. für Land- und Forstwirtsch.*, 32, 158 pp., 3 graphs, 15 maps, 1927.

This report, prepared on similar lines to those of previous years [*R.A.M.*, vi, p. 463], contains an important new feature in the shape of maps showing the correlation between meteorological and climatic conditions and the incidence of various insect pests and fungous diseases. Dr. H. Pape is mainly responsible for the sections on fungous and bacterial diseases, while Dr. O. Schlumberger supplies the information on wart disease of potatoes (*Synchytrium endobioticum*).

The foot rots of cereals (*Leptosphaeria herpotrichoides*, *Ophiobolus herpotrichus*, and *Fusarium* spp.) caused heavy damage in a number of districts. It was observed in Westphalia and Bavaria that the incidence of infection was particularly heavy in crops following clover, while in Hanover the diseases occurred chiefly on alkaline soils and in newly planted fields. Plumed spore disease of wheat (*Dilophospora alopecuri*) [ibid., vi, p. 146] occurred in the Stendal district of Saxony in association with *Tylenchus tritici*. Leaf spot (*Septoria graminum*) was recorded on wheat and other cereals in several districts, and *Marssonia* [*Rhynchosporium*] *secalis* was reported from Silesia.

There was comparatively little spread of potato wart during the dry summer of 1925, and the enforcement of the regulations relating to the cultivation of immune varieties has kept infection within bounds. The largest number of new records came from the Rhine Province (119) and Westphalia (228). Bacterial wet rot caused heavy damage in the field and among stored potatoes in a number of districts. Sclerotial disease (*Sclerotinia sclerotiorum*) was reported from Hanover. Sprain [ibid., vi, p. 247] was unusually prevalent in Westphalia from the end of October onwards, the Modrow's Johannsen variety being particularly susceptible.

Clover was severely damaged in a number of districts by *S. trifoliorum*, which appears from observations in Lübeck to persist for seven years in the soil. *Gloeosporium caulivorum* caused heavy damage to the clover crop in Mecklenburg, while both clover and lupins were so seriously injured in Saxony by the leaf spot due to *Macrosporium sarcinaeforme* that it was necessary to plough up a

number of fields. Lupins were also attacked by foot rot (*Fusarium vasinfectum* and other organisms).

Tomatoes suffered severely from bacterial fruit rot (*Bacterium briosii*) in Silesia, the Saxon Free State, and Brandenburg, while *Cladosporium cucumerinum* was very injurious to cucumbers in various districts. *Rhizoctonia violacea* [*R. crocorum*] damaged the asparagus crop in the Gotha district. Flax was damaged by *F. lini* at Dahlem (Berlin) and by *G. lini* in Silesia.

Apple mildew (*Podosphaera leucotricha*) was less prevalent than usual, except in Baden and Hesse. Leaf scorch of cherries (*Gnomonia erythrostoma*) [see below, p. 35] was again extremely severe in Baden and an isolated case was also reported from the Saxon Free State. Gooseberry mildew (*Sphaerotheca mors-uvae*) was extremely prevalent in Württemberg, Baden, and elsewhere. In the former province, where the damage amounted to 90 per cent. in places, infection was most severe on smooth, red varieties growing in old plantations with an abundance of shade. Cane blight of raspberries (*Didymella applanata*) devastated a number of plantations in Pomerania and Anhalt [ibid., ii, p. 128].

Comparatively little damage was caused by downy mildew of the vine (*Peronospora* [*Plasmopara*] *viticola*) except in Hesse-Nassau, where the late summer was very wet. Heavy losses were recorded in the vineyards of the Rhine Province and elsewhere from the attacks of *Botrytis cinerea*, which caused a severe rotting of the petioles. Roter brenner (*Pseudopeziza tracheiphila*) was very prevalent in the Rhine Province; in the Coblenz district it occurred unusually early on light soils and in vineyards which had not been manured in the previous year, while in the Moselle Valley it is stated to be of greater importance than downy mildew and *Oidium* [*Uncinula necator*] but little effort is made to control it.

Young firs and twenty-year-old silver firs [*Abies pectinata*] were damaged by *Trichosphaeria parasitica* in Württemberg. Fifteen-year-old white pines [*P. strobus*] were infected by *Cenangium abietis* [ibid., vi, p. 706].

Carnations were attacked by rust (*Uromyces caryophyllinus*), *Pseudodiscosia dianthi*, and *Fusarium dianthi* in various districts. A wilt disease of asters [*Callistephus chinensis*], caused by *Verticillium albo-atrum*, is reported to be spreading among white, pale-leaved varieties at Darmstadt. *Heterosporium gracile* [*Didymellina macrospora*: ibid., v, p. 33] attacked the leaves of gladioli in Westphalia, and of *Iris germanica* and *I. pallida* in Schleswig-Holstein.

Jahresbericht der Preussischen Landwirtschaftlichen Versuchs- und Forschungsanstalten zu Landsberg a. d. Warthe. Jahrgang 1926–27. [Annual Report of the Prussian Agricultural Experimental and Research Institutes at Landsberg a. d. Warthe. Year 1926–27.]—*Landw. Jahrb.*, lxvi, Supplement 1, pp. 215–251, 8 figs., 2 graphs, 1927.

This report, prepared on similar lines to those of previous years [*R.A.M.*, vi, p. 12], contains the following items of interest in addition to those already noticed from other sources. Extensive tests were made with a number of dusts for the control of seed-borne

fungous diseases of cereals [not specified]. None of the preparations proved entirely satisfactory, the best results being given by 0.2 per cent. abavit B, höchst [tillantin], tutan rot, and the Saccharinfabrik disinfectants, 225, 175, and 175 V. The average cost of treating 10 cwt. of rye or wheat seed-grain with the three first-named preparations is estimated at Mk. 5·50, 5·25, and 8·00 respectively, compared with Mk. 1·00 and 3·40 for 0·1 per cent. formaldehyde and 0·25 per cent. germisan (liquid), respectively.

Acute phloem necrosis was found to be a constant accompaniment of true leaf roll of potato, as distinct from spurious forms of the disease, in which this characteristic symptom was sometimes absent. It was never observed in plants affected by mosaic, stipple-streak, and allied diseases.

Preliminary inoculation tests with *Rhizoctonia solani* on potato tubers of three different varieties resulted in the production of well-defined symptoms of leaf roll distinct from the ordinary type occurring on the upper leaves (Gipfelroller). The edges of the affected leaves curved slightly upwards and the foliage showed a reddish to purple discoloration.

Twenty-one early, 6 medium-early, 11 medium-late, and 18 late varieties of potatoes [which are enumerated] were resistant to mosaic in a test conducted during the period under review, the corresponding figures for leaf roll being 10, 3, 8, and 11.

Good control of late blight of potatoes (*Phytophthora infestans*) was obtained by spraying with 2 per cent. Bordeaux mixture or 1·5 per cent. nosprasen. Dusting with nosprasit, nosperit, Schering's preparation, cusisa, and pota also resulted in an increased yield, but this mode of treatment cannot yet be generally recommended.

Root rot of beets [*Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*] occurred with practically uniform severity on all the sugar and fodder varieties tested. No improvement was effected in a field test by treatment of the seed-clusters with tutan dust, betanal (liquid), or 538 C II dust, but in a laboratory experiment the incidence of *P. betae* was reduced by tutan. The application to the soil of slaked lime or carbonate of lime in quantities of 7·5, 15, or 30 cwt. per 0·25 hect. prevented the development of root rot.

Bericht der Lehr- und Forschungsanstalt für Wein- Obst- und Gartenbau zu Geisenheim a. Rh. für das Rechnungsjahr 1926. [Report of the Viticultural, Pomicultural, and Horticultural College and Research Institute at Geisenheim a. Rh. for the financial year 1926.]—*Landw. Jahrb.*, lxvi, Supplement 1, pp. 311–380, 1927.

This report, prepared on the usual lines [*R.A.M.*, vi, p. 393], contains the following items of interest in addition to those already noticed from other sources. Tomato canker (*Didymella lycopersici*) [the symptoms and mode of infection of which are briefly described] was observed for the first time in a greenhouse in the neighbourhood of Wiesbaden and occurred in a very severe form. The control measures recommended include thorough ventilation, destruction of infected material, liming of the soil, disinfection of walls and panes with 2 per cent. copper sulphate, and fumigation of the houses with sulphur.

A consignment of sweet williams (*Dianthus barbatus*) from Baden was heavily attacked by rust (*Puccinia arenariae*) in association with *Ascochyta dianthi*. The latter fungus has been reported from Italy (*Zeitschr. für Pflanzenkrankh.*, ix, p. 299, 1899) in conjunction with *Uromyces caryophyllinus*.

A species of *Pestalozzia*, probably *P. guepini*, was found on the shoots and leaves of a diseased rhododendron.

Statice tatarica plants submitted for examination were affected by a dry heart rot, associated with the presence of a *Phoma*, together with species of *Fusarium* and bacteria. The heart leaves of diseased plants showed a dark bluish-green discoloration.

Hawthorn (*Crataegus oxyacantha*) trees near Bonn were defoliated by a leaf spot due to a species of *Entomosporium* [*R.A.M.*, iii, p. 216]. This fungus has apparently not hitherto been found on *Crataegus* in Germany.

The plumed spore disease (*Dilophospora graminis*) [*D. alopecuri*: ibid., vi, p. 146] was observed (for the first time in the Wiesbaden district) on wheat in the Taunus mountains.

Further investigations on the so-called 'mauke' or scab disease of the vine (*Bacterium tumefaciens*) [ibid., vi, p. 270] showed that infection is by no means confined to damp soils or to situations exposed to spring frosts [ibid., vi, p. 526]. On the other hand, the cumulative effect of the prevailing meteorological conditions appears to be of great importance in determining the incidence of the disease, which occurs with particular severity in seasons of little sunshine and high rainfall. The infectious character of 'mauke' was proved by its successful transmission from diseased to healthy vines.

Bericht der Lehr- und Forschungsanstalt für Gartenbau in Berlin-Dahlem für das Rechnungsjahr 1926. [Report of the Horticultural College and Research Institute in Berlin-Dahlem for the financial year 1926.]—*Landw. Jahrb.*, lxvi, Supplement 1, pp. 383–457, 8 figs., 6 graphs, 1927.

This report, prepared on similar lines to those of previous years [*R.A.M.*, vi, p. 274], contains the following items of phytopathological interest. Complete control of leaf mould of tomatoes (*Cladosporium fulvum*) was obtained by spraying with 1 per cent. nosperal with an admixture of $\frac{3}{4}$ kg. of quicklime per 100 l.; 2 per cent. Bosna paste (copper and zinc salts); ciprin A with an admixture of lime to produce a slightly alkaline reaction; 1 per cent. Bordeaux mixture; and 1 per cent. solbar. The first application was given about four days after planting. In the case of this devastating malady timeliness of application appears to be more important than the choice of a fungicide.

A number of iris varieties were tested for resistance to the leaf spot caused by *Heterosporium gracile* [*Didymellina macrospora*: *R.A.M.*, v, p. 33]. Frithjof, l'Innocence, *Iris mounieri*, *I. anberosa*, *I. aurea*, *I. pallida perfecta*, and *I. arnoldii* were immune, while *I. pallida*, *I. germanica*, *I. florentina*, Ingeborg, Helge, Ulysses, and Gambetta were very susceptible. Good control of the disease was effected by spraying with 1 per cent. Bordeaux mixture, 1 per cent. solbar, and 1 in 40 lime-sulphur.

Cladosporium cucumerinum, introduced on melon seed, was well controlled by spraying with 1 per cent. Burgundy mixture.

Laubert (R.). **Botanische, phänologische und pflanzenpathologische Beobachtungen am Garda-See.** [Botanical, phenological, and phytopathological observations on Lake Garda.]—*Gartenflora*, lxxvi, 7, pp. 284–286; 9, pp. 367–370; 10, pp. 402–403, 2 figs., 1927.

The trunks of the olive trees surrounding Lake Garda were observed to be very liable to attack by *Polyporus* [*Fomes*] *fulvus*, but much care is taken to remove the decayed portions, with the result that the trees survive for many years. Olive knot (*Pseudomonas savastanoi*) [*R.A.M.*, v, p. 679] is stated to be of little importance in the districts visited by the author during the spring of 1927. Other fungi occurring on olives were *Gloeosporium nobile*, which produces circular brown spots on the leaves, while *Polyporus* [*F.*] *fomentarius* and *Polystictus versicolor* were sometimes found causing decay of the trunks.

Other records include *Phyllosticta ilicicola* and *Monochaetia saccardoi*, often producing pale, round, dry lesions on the leaves of *Quercus ilex*; tumours on the leaves, shoots, and previous season's inflorescences of oleander [*Nerium oleander*], probably caused by crown gall [*Bacterium tumefaciens*]; *Corticium* sp. causing stem rot of *Ligustrum japonicum*; *Coniothyrium concentricum* disfiguring the foliage of *Agave* and *Yucca* with large, circular to elongated, dark spots; *C. hellebori* on *Helleborus niger*, *Ramularia hellebori* var. *nigricans* on *H. foetidus*; *Peronospora rubiae* causing deformities of the shoots of *Rubia tinctorum*; and *Colletotrichum hederae* on *Hedera*.

Wilkinson (H.). **Annual Report of Mycologist.**—*Ann. Rept. Dept. of Agric. Kenya for the year ending 31st December, 1926*, pp. 152–157, 1927.

Sugar-cane mosaic in Kenya Colony appears to be still confined to the Nyanza Province. Even in badly infected cane fields, however, no mosaic has so far been found on grasses. Most of the crop grown in the Province is of the resistant Uba variety. An attempt at the complete eradication of the disease is being made and legislation for this purpose has been introduced [*R.A.M.*, v, p. 576].

Streak disease of maize, first reported in 1925 [ibid., vi, p. 533], caused much damage in the Kikuyu Reserve, but remained unimportant on European farms. The jassid leafhopper [*Balclutha mbila*: ibid., vi, p. 377], which transmits the disease in Natal, has not been found in Kenya, and transmission experiments with various species of leafhoppers found on affected maize gave negative results. Streak disease of sugar-cane was found on the Uba variety.

The seedling disease of coffee previously noted [ibid., v, p. 299] was found in another nursery in Kyambu district and a possibly identical disease was observed on *Podocarpus* seedlings. Further successful inoculations on coffee seedlings were obtained with *Rhizoctonia solani* isolated both from the diseased coffee seedlings

and from strawberry roots, and this fungus is regarded as the cause of the disease.

Most varieties of 'bronze tipped' coffee on one estate appeared resistant to berry disease [*Glomerella cingulata*: loc. cit.] which [on p. 176 of the *Report*] is stated to have caused the loss of the whole crop in Kericho.

A species of *Cerebella*, identified as *C. sorghi-vulgaris*, was found on ears of self-sown rye; this fungus also occurs on sorghum, broom corn, and *Cynodon dactylon*, but does little damage.

A disease which attacked the heads of maize was caused by a species of *Fusarium* believed to be a stage of *Gibberella saubinetii*; it frequently destroyed 50 per cent. of individual crops. The seedling blight caused by the latter fungus has not yet been observed in Kenya.

Glume blotch of wheat (*Septoria nodorum*), not hitherto recorded in the Colony, occurred in most districts where wheat was grown but only seriously reduced the yield in the higher altitudes [see next abstract].

Other fungi reported for the first time include *Sclerophoma mali* on apple and pear stems; leaf spot of cowpea caused by a species of *Septoria* (? *S. glycines*); *Woroninella dolichi* on cowpea; *Nectria flavolanata* and *Polystictus occidentalis* on *Acacia melanoxylon*; a species of *Poria* on roof bean (*Warburgia ugandensis*); *Puccinia penniseti* on bulrush millet (*Pennisetum typhoideum*) and probably also on *P. cenchroides*; *Ceratostoma juniperinum* producing galls on cedar (*Juniperus procera*); *Fusarium heterosporum* on *Cynodon dactylon*; and *Beniowskia penniseti* on *Setaria aurea.*

Burton (G. J. L.). **Report of Plant Breeder.**—*Ann. Rept. Dept. of Agric. Kenya for the year ended 31st December, 1926*, pp. 158–171, 1 pl., 1927.

The following observations on the distribution of wheat rusts in Kenya during 1926 are included in this report. Black stem rust [*Puccinia graminis*] was more prevalent than yellow rust [*P. glumarum*] and is becoming established at the higher altitudes, where hitherto yellow rust has been the chief danger. A severe attack of black rust was noted on a Pusa wheat at 8,500 ft. in the Thomson's Falls area, and a moderate attack on Marquis wheat at 9,500 ft. in the Mau Narok area. This is the only dangerous rust at the lower altitudes. Orange leaf rust [*P. triticina*] was also common in the colony.

Equator wheat was resistant to *P. graminis* at levels above 7,000 ft., and was the only variety immune from *P. glumarum*, but proved highly susceptible to loose smut [*Ustilago tritici*]; this late maturing variety should be grown at high altitudes, with the early ripening Florence wheat as a subsidiary crop, as the latter is fairly resistant to *P. glumarum*, though susceptible to *P. graminis*. At low and medium altitudes, where *P. graminis* is the chief danger, only Kenya Governor, the wheat most resistant to this rust, should be grown, except near Mount Elgon, where Equator wheat can be grown almost as safely.

During 1925 there was a severe epidemic of black rust in the Trans Nzoia, a region where the disease had hardly ever been seen

previously, and the only wheat which proved immune was a bearded variety of Cross XI (a mixture of varieties), designated by the author 'Sabwani'. Amongst the selected progeny of this variety in 1926, one pure line of a tip-bearded, brown-chaffed type remained immune from *P. triticina* as well as from *P. graminis*. It is thought that this type will prove valuable in crossing with lines already immune from black rust and yellow rust to produce a wheat resistant to all three species of rust.

The behaviour of certain varieties towards rust varies in the different districts. Only in the Trans Nzoia and the Plateau was Equator wheat immune from *P. graminis* at altitudes lower than 7,000 ft., and the author suggests either that some of the strains of black stem rust in the Trans Nzoia differ from those elsewhere, or that soil properties and climate may affect resistance.

A species of *Macrophoma* [*Septoria nodorum*: see preceding abstract] was noted on wheat in 1926, apparently for the first time. The disease was marked by the appearance of black spots on the chaff, and in extreme cases by dark longitudinal markings on the stem. It became evident shortly after flowering, and soon the ears appeared as if prematurely ripened off, while the rest of the plant remained green. In some cases no grain formed, in others it shrivelled up. The disease was most destructive on the Plateau, but was common in all cold, wet regions. Wheat growing in sheltered positions suffered most. The author considers that the disease is not endemic, but will recur when similar weather prevails.

[Shepherd (E. F. S.).] **Botanical Division.**—*Ann. Rept. Mauritius Dept. of Agric. for the year 1926*, pp. 15–18, 1927.

This report contains the following items of phytopathological interest. A hitherto unreported abnormal condition of sugar-cane, to which the term 'bunch top' is applied, occurred on the White and Striped Tanna varieties on five estates. The disturbance is believed to be of physiological origin, and has, so far, caused no appreciable loss. Streak disease of sugar-cane [*R.A.M.*, vi, p. 377] occurred on eight estates during 1926, but the incidence of infection was very low (not exceeding 1 per cent.), and R.P. 8 was the only variety affected. The aerial transmission of this disease is apparently still slow in Mauritius [ibid., vi, p. 16]. In 1925 a similar disease was observed on maize, *Coix edulis*, and eight species of wild grasses, and during 1926 *Cenchrus echinatus* and two undetermined species of wild grasses were added to the list. Gumming disease of sugar-cane (*Bacterium vascularum*) was again prevalent, especially on the M. 131, M. 55, M. 87, and Port Mackay varieties. Partial or total destruction of sugar-cane setts by pineapple disease (*Thielaviopsis paradoxa*) was frequently reported: preliminary experiments in the control of this disease by immersion of the setts in 4–5–40 Burgundy mixture gave encouraging results. Red rot (*Colletotrichum falcatum*) affected White Tanna, D.K. 74, M. 131, M. 33, M. 87, R.P. 6, and M. 55 canes, causing failure of germination on two estates. Root disease, associated with unfavourable conditions of growth, was reported from five estates. The spores of a fungus isolated from a case of a disease resembling collar rot in an unknown cane variety in the Black River were closely allied

to, if not identical with, those of *Hendersonina sacchari*, the causal organism of the latter disease.

The unhealthy appearance of the coco-nut palms at Pointe aux Sables is attributed to the waterlogged condition of the soil in some areas and to a deficiency of water in others, rather than to the presence of any specific soil organism. Inoculation tests with fungi isolated from diseased coco-nut roots [species of *Botryodiplodia* and *Chaetostroma*: loc. cit.] have given negative results.

A number of filao (*Casuarina equisetifolia*) trees grown in plots for an experiment in the transmissibility of 'smut' (*Trichosporium vesiculosum*) were killed by the attacks of an undetermined soil parasite. Only one of these trees bore the spores of *T. vesiculosum* in the bark. A disease characterized by similar symptoms was observed near Point d'Esny, and in this case also the spores of *T. vesiculosum* were found in the bark of one tree.

Tobacco was attacked by Granville wilt (*Bacillus* [*Bacterium*] *solanacearum*) and by leaf spots of various types—one due to *Cercospora*, another apparently of bacterial origin, and a third, a white speck, which seems to be due to physiological causes.

A collar rot of peas at Rose Hill was found to be associated with a species of *Fusarium*.

The *Sphacelia* stage of an ergot [? *Claviceps* sp.] was found on *Paspalum dilatatum* and *Panicum maximum*.

The Beureum, Bitter, and Negrita varieties of *Manihot utilissima* appear to be resistant to the die-back of the twigs believed to be caused by *Gloeosporium manihotis*.

Wilted banana plants submitted for inspection from Grand Port showed symptoms very suggestive of the moko disease (*Bacillus musae*) [*Bact. solanacearum*: ibid., vi, pp. 496, 626].

BROOKS (A. J.). **Annual Report of the Department of Agriculture, Colony of the Gambia, for the period 1st January, 1926, to 31st March, 1927,** 53 pp., 1 pl., 2 graphs, 1927.

An outbreak of rosette disease of groundnuts at a seed farm of the Agricultural Department of the Gambia, in which all the varieties grown proved equally susceptible, was eradicated by weeding out affected plants immediately the condition was seen. In general, it has been observed that plants sown late suffer most, and evidence obtained during the past season supports the view that the disease develops and spreads most rapidly during dry periods. At the Agricultural and Botanical Station, experiments indicate that the application to the soil of nitrogenous or phosphatic fertilizers does not affect the susceptibility of groundnuts to rosette. A large number of varieties is being tested at this station, the incidence of rosette varying from 5 to 75 per cent. The most resistant variety was Philippine White, a variety obtained locally from the Philippine Pink.

The rosette disease was most common on farms within three miles of the sea. Experiments demonstrated that infection is more severe in nuts left in the ground from the previous season than in shelled nuts sown with the rains. It was frequently found that, of two kernels contained in the same shell, germinating and developing together, one was heavily infected with rosette and failed to pro-

duce seed, while the other showed no effects and bore a normal crop. *Aphis leguminosae*, which transmits the disease in South Africa [*R.A.M.*, iv, p. 648], has not been found up to the present in the Gambia, where a jassid [unspecified] is thought to be the vector.

Experiments [the results of which are tabulated] suggest that the plant deteriorates before the disease is visible, and that the condition lowers the yield in some other way than by limiting respiration. Rosette reduces the number of nuts on the plant, and increases the number of empty shells among them.

Report of the California Agricultural Experiment Station from July 1, 1925, to June 30, 1926.—102 pp., 1926. [Received July, 1927.]

This report contains the following scattered references of phytopathological interest other than those already noticed from different sources. An investigation of the inheritance of wheat bunt (*Tilletia tritici*) in two strains of the Galgalos variety showed that one of these produces 5 and the other 25 per cent. of infection under identical conditions. The Martin variety is immune from the disease, and it appears probable that this quality can be transferred to the commercial wheats by a system of back-crossing.

Wheat seed-grain treated with copper carbonate was fed to mice without producing any ill effects.

It was shown that satisfactory infection for experimental work with covered smut of barley (*Ustilago hordei*) can be obtained by skinning the grain by hand [*R.A.M.*, iv, p. 271], but this method is too laborious for use on a large scale. Preliminary greenhouse and field experiments indicate that the barley hull, lemma, and palea can be rapidly removed with acid, thereby ensuring a high percentage of infection.

Several new types of citrus fruit decay were studied, including pink mould (*Penicillium roseum*) and the rots due to *Trichoderma lignorum*, *Fusarium* sp., and *Pleospora* sp. The scraping method has been found very effective in the treatment of psorosis [ibid., v, p. 298].

A study on varietal resistance to gummosis (*Pythiacystis* [*Phytophthora*] *citrophthora*) revealed sufficiently marked differences in the susceptibility of the trunk tissue of the lemon and sour orange [*Citrus bigaradia*] to justify the use of these species as material for an investigation of the basis of chemical immunity. The inhibiting factor (or factors) was shown by inoculation experiments to be water-soluble and thermostable; it is probably present as a constituent of the cell sap to which the protoplasts are impermeable. Seedlings of the above-mentioned species showed no difference in injury due to extracellular toxic substances produced by *P. citrophthora* in pure culture.

A further study of crown rot of walnuts [ibid., v, p. 20] confirmed previous data as to the susceptibility of the southern black walnut (*Juglans californica*) compared with the English walnut (*J. regia*) and the northern black walnut (*J. hindsii*). A species of *Phytophthora* has been isolated from lesions on the bark of English walnuts.

Further tests on the reaction to crown gall [*Bacterium tumefaciens*] of different species of *Prunus* showed the following descending order of resistance: *P. pumila*, *P. mume*, *P. umbellata*, *P. angustifolia*, and *P. mexicana*. *P. mume* has been found to serve as a good stock for apricots and as a fair one for *P. domestica*.

GARDNER (M. W.). **Indiana plant diseases, 1925.**—*Proc. Indiana Acad. Sci.*, xxxvi (*1926*), pp. 231–247, 9 figs., 1 graph, 1927.

This is the seventh of a series of annual reports on the occurrence of plant diseases in Indiana [*R.A.M.*, vi, p. 275]. Among other items not already noticed from different sources, the following are of interest.

A shallow surface spotting of Grimes apples, caused by an apparently undescribed fungus, was observed in 1924 and 1925 when the fruit was removed from storage in February or March. The lesions were irregularly circular, slightly sunken, light brown spots, 5 to 15 mm. in diameter, with an indistinct margin and a silvery area in the centre due to the presence of air below the epidermis. The cells of ten to twelve sub-epidermal layers were brown and collapsed. The fungus isolated from the affected tissues is characterized by a greyish-white, flocculent aerial mycelium with numerous compound hyphal strands. The hyaline, elliptical spores form small heads at the apices of the short, simple sporophores. The fungus actively dissolves the starch in cornmeal agar. Wounded and unwounded fruit was successfully inoculated with fragments of agar colonies, brown lesions, from which the fungus was reisolated, being produced in the latter case. The host cells were found to be freely penetrated by abundant mycelium.

The damage caused by brown rot (*Sclerotinia fructicola*) [see below, p. 32] in an orchard of Krummel peaches was estimated at 1,500 bushels, worth $4,500. The trees had been well sprayed, and infection occurred chiefly in the many growth cracks caused by a late fertilizer application, and by the high September rainfall. Twig infection occurred from the growth of the fungus through the peduncle of the rotted fruits. The frequent presence of numerous unsprayed seedling trees is thought to be an important factor in the development of brown rot in commercial orchards.

Sphaeropsis malorum [*Physalospora cydoniae*] produced a typical black rot on peaches severely injured by hail.

Raspberries were attacked by powdery mildew [*Sphaerotheca humuli*].

The causal organism of yellows (*Fusarium conglutinans*) was found in the vascular bundles of typically diseased kohlrabi [*Brassica oleracea* var. *caulo-rapa*].

Both yellow and red varieties of onions in storage were infected by blotch (*Macrosporium* sp.) and silver spot (*Penicillium* sp.), the former characterized by numerous narrow, black, longitudinal rifts in a greenish area, and the latter by a row of small circular, silver patches along the veins.

Radishes at Lafayette were affected by mosaic, and also showed small black lesions, associated with the presence of an *Alternaria*, on the leaves, peduncles, and seed pods.

The purple seed stain of soy-beans observed in 1924 occurred

again, and was found to be due to a species of *Cercospora*. The disease is thought to be probably identical with that caused by *C. kikuchii* in Japan [ibid., iv, p. 715].

The double virus or streak type of tomato mosaic [ibid., v, p. 636] was common in greenhouses. Observations in Indiana indicate that only the typical tomato mosaic is carried in perennial weeds such as *Physalis*, the other virus being frequently present in healthy as well as in mosaic potato plants [ibid., vi, p. 501]. A study of the effects of the filiform or fern-leaf type of mosaic [ibid., vi, p. 449] on the floral anatomy showed important modifications of the calyx and corolla lobes in addition to the extreme reduction of the leaves.

Crown wart of lucerne (*Urophlyctis alfalfae*) was observed near Madison, this being the first record of its occurrence east of the Rocky Mountains. Other diseases reported on this crop include bacterial blight (*Pseudomonas medicaginis*) and root rot (*Aplanobacter insidiosum*) [ibid., vi, p. 338].

Mosaic occurred in four strains of red clover [*Trifolium pratense*] and in *T. arvense*, *T. subterraneum*, *T. incarnatum*, and *T. resupinatum*, infection being seed-borne in the last-named species.

A bacterial spot disease of buckwheat [*Fagopyrum esculentum*] was characterized by irregularly circular spots with a brick- to madder-red centre and a narrow halo round the edge.

A malformation of delphinium foliage, accompanied by partial failure of the blossoms, is suspected to be due to a virus disease.

Geraniums were attacked by bacterial spot (*Bacterium erodii*) and by mosaic, the latter disease also affecting *Helianthus strumosus* and *Anchusa officinalis*.

A thread blight, apparently due to a species of *Rhizoctonia*, occurred on black oak [*Quercus nigra*].

[Young (V. H.) & Rosen (H. R.).] **Plant diseases.**—*Thirty-eighth Ann. Rept. Arkansas Agric. Exper. Stat. for the fiscal year ending June 30, 1926*, pp. 52–59, 4 figs., 1926. [Received October, 1927.]

This report contains the following references of interest in addition to those already noticed from other sources. Further attention has been paid to the development of cotton strains resistant to wilt (*Fusarium vasinfectum*) [*R.A.M.*, vi, p. 291]. About 150 selections and 30 varieties were grown in a field which had previously received a heavy application of pure cultures of the fungus from cotton stems. The soil varied from sandy loam to almost pure sand, and in former years the field had shown up to 75 per cent. of infection. During the past three years, however, the incidence of wilt in the selected strains has been negligible. Further work in connexion with the breeding of wilt-resistant cotton is in progress near Little Rock, where severe losses occur almost every year on the sandy Arkansas River bottom soil. Preliminary data indicate the existence of great differences in susceptibility. It was incidentally shown in the course of this work that angular leaf spot of cotton [*Bacterium malvacearum*] may be controlled by the sulphuric acid delinting process [ibid., v, p. 82; vi, p. 225], whereas organic mercury compounds gave very poor results on seed that had not been delinted.

Studies in the relation of soil temperature to the development of cotton wilt have shown that little infection occurs above 35° C. Soil temperatures of 37·5° and 40° also seem to be very detrimental to the growth of the host. It appears unlikely that the disease will develop to an appreciable extent below 25°, the optimum temperature for the growth of the fungus being near that of other species of *Fusarium* that cause wilts (27° to 28°).

Stem rot of rice (*Sclerotium oryzae*) [ibid., v, p. 517] continues to spread slowly, and in localized areas constitutes the principal limiting factor in production. Infection being disseminated by soil, stubble, and straw, precautions should be taken to prevent the spread of such material in separators, on the wheels of machinery, and by live stock. Drainage of irrigation water from diseased to healthy fields should be avoided, and rice from affected areas should not be used for seed. Rotation, especially with a well-cultivated dry land crop, greatly reduces the incidence of stem rot, and promises to be the best control measure.

Further observations on mosaic of sweet potatoes [ibid., v, p. 448] indicate that the disease is not transmissible to healthy plants in northern districts, whereas in Florida and other regions near the Gulf of Mexico transmission is liable to occur.

SHERBAKOFF (C. D.). **Plant pathology.**—*Thirty-ninth Ann. Rept. Tennessee Agric. Exper. Stat. 1926*, pp. 37–41, 7 figs., 1927.

The most important wheat diseases of Tennessee are stated to be, in the order named, head blight (scab) [*Gibberella saubinetii*], leaf rust [*Puccinia triticina*], covered smut [bunt: *Tilletia levis*], loose smut [*Ustilago tritici*], stem rust [*P. graminis*], and root rot [*Ophiobolus graminis*, etc.]. Eight promising scab-resistant strains of winter wheat are being tried at the Knoxville Station.

The following *Fusarium* diseases are of considerable economic importance: wilts of tomato, watermelon, and cotton [*F. lycopersici*, *F. niveum*, and *F. vasinfectum*, respectively], cabbage yellows [*F. conglutinans*], stem rot of sweet potatoes [*F. hyperoxysporum* and *F. batatatis*], and root rot of maize [*F.* stages of *G. saubinetii* and *G. moniliformis*]. Some excellent varieties of wilt-resistant tomatoes, including a pink one selected at the Experiment Station, are stated to be available.

Two years' nursery work on crown gall of apples [*Bacterium tumefaciens*] indicates that profitable control can be achieved by an increase of soil acidity, the adjustment being effected either by an application of sulphur or by the use of acid in preference to alkaline fertilizers, or by both methods combined.

An extensive supply of dark tobacco seed from selected strains resistant to wildfire and blackfire [*Bact. tabacum* and *Bact. angulatum*] is available for experimentation on a large scale.

It has been shown that the concentrated sulphuric acid ordinarily used in the delinting of cotton seed for the control of certain diseases [see preceding abstract] may be replaced by a dilute mixture (1 part of sulphuric acid to 5 of water for 60 parts, by volume, of seed). Rolling the seed in air-slaked lime a week or more after treatment was found to be an effective substitute for washing.

ULTÉE (A. J.). **Verslag over de werkzaamheden van het Proefstation Malang in het jaar 1926.** [Report on the work of the Malang Experiment Station in the year 1926.]—*Meded. Proefstat. Malang*, 62, 40 pp., [1927].

This report contains the following scattered references of phytopathological interest. *Crotalaria anagyroides* was attacked by *Septobasidium bogoriense* to a greater extent than in the previous year. Apart from sporadic infection by *Rhizoctonia*, *Centrosema pubescens* suffers very little from disease.

Leaf disease (*Hemileia*) [*vastatrix*] was prevalent on Robusta coffee during the very dry east monsoon, but most of the trees recovered with the onset of the rains. Material of the brown and black root fungi (*Fomes lamaoensis* and *Xylaria thwaitesii*) was received from coffee plantations. The fruiting bodies of the latter organism have not yet been found in the Malang district. The die-back disease of coffee reported in 1925 [*R.A.M.*, v, p. 475] is stated to be on the increase on various estates in Sumatra, whereas in the Malang district no extension has occurred.

Rubber was attacked by *Rigidoporus microporus* [*F. lignosus*: ibid., iv, p. 701], *Ganoderma pseudoferreum*, *Ustulina maxima* [*U. zonata*], *X. thwaitesii*, and the red root disease, the causal organism of which cannot be identified in the absence of fructifications. Mildew (*Oidium*) [*heveae*] followed a similar course to that observed in 1925 [ibid., v, p. 475]. This disease is believed by planters to be responsible for the die-back of the branches, and great anxiety is felt concerning its occurrence. Brown bast was reported from several estates, and the method of Keuchenius for the control of this disease [ibid., iv, p. 310] has been successfully adopted in some plantations. Stripe canker of rubber [*Phytophthora* sp.] was best controlled by an alcoholic solution of resin.

CIFERRI (R.). **Informe de fitopatología. Principales enfermedades de las plantas cultivadas, observadas en el curso del año 1926.** [Report on phytopathology. Principal diseases of cultivated plants observed during the year 1926.]—*Segundo Informe Anual Estac. Nac. Agron. Moca, Republica Dominicana, 1926*, pp. 36–44, 1927.

This report, prepared on similar lines to that of the previous year [*R.A.M.*, v, p. 599], contains the following references of interest, in addition to those already noticed from other sources.

Avocados (*Persea gratissima*) were attacked by *Meliola perseae* and by a foot rot resembling gummosis. A fruit rot of *Anona muricata* was sometimes associated with *Colletotrichum gloeosporioides* [*Glomerella cingulata*], while *Meliola psidii* is common on guavas (*Psidium guajava*). A species of *Fusarium* causes rotting and eventual mummification of mango fruits.

Root rot (*Rhizoctonia violacea*) [*R. crocorum*] occurs on lucerne in the irrigated soils of San Juan de la Maguana. *Cercospora medicaginis* is occasionally observed on the same host. Rust of cotton (*Kuehneola gossypii*) [*K. desmium*] is widespread, and under certain conditions cotton seedlings are infected by root rot apparently due to *Rhizoctonia* (? *solani*), sometimes associated with *Ozonium* [*Phymatotrichum*] (? *omnivorum*).

Piricularia oryzae is common on rice, while *Cercospora oryzae* has only once been observed in Bonao. Sugar-cane is affected chiefly by red rot (*Colletotrichum falcatum*) and mosaic. Maize is extensively but not severely attacked by rust (*Uredo pallida*) [*Puccinia pallescens*] and by mosaic disease. During the rainy season *Trichothecium roseum* and *Botryosporium elegans* are frequently found on maize ears. Guinea grass (*Panicum maximum*) is infected by *Cercospora panici*.

In some parts of Moca up to 50 per cent. of the leaves of sweet potatoes were attacked by *Albugo* [*Cystopus*] *ipomoeae-panduratae*, while a species of *Diplodia* (probably *D. tubericola*) also occurred sporadically. *Phytophthora infestans* and *Phoma destructiva* were found on market tomato fruit. *Fusarium lycopersici* causes the worst disease of this crop, on which *Cladosporium fulvum* is also common. *Cephalosporium acremonium* sometimes damages tomato fruits. Eggplant (*Solanum melongena*) occasionally shows infection by *Gloeosporium melongenae*, while *Phytophthora infestans* and *Cladosporium fulvum* are comparatively frequent. A species of *Cercospora* (probably *C. hibisci*) occurs on *Hibiscus esculentus* and also a fruit rot apparently of bacterial origin.

Phyllosticta bixina and *Uredo bixae* are occasionally observed on annatto (*Bixa orellana*). *Creonectria* [*Nectria*] *bainii* is one of the organisms associated with canker of cacao, while *Botryodiplodia theobromae* appears to be of minor importance. *Aspergillus fumigatus* has been found causing a 'smut' of cacao pods at San Cristobal. An intensely destructive root rot is responsible for heavy losses in cacao plantations, which are stated to be in an extremely neglected condition in the Republic. Several obscure root rots also cause severe damage to the otherwise promising coffee crop, especially in nurseries, where infection may amount to 80, and averages 10 to 20 per cent.

A species of *Phytophthora* was found in the roots of cinnamon (*Cinnamomum zeylanicum*) plants growing in excessively wet soil; the loss from this cause was estimated at 40 per cent. Kola nut (*Cola vera*) and nutmeg (*Myristica fragrans*) trees in the nurseries of the Station were also heavily damaged during the rains by species of *Phytophthora*, and a rot of young papaw trees was associated with a fungus of the same genus. Among the organisms encountered on citrus trees was *Phyllosticta aurantiicola*. Gummosis causes heavy damage throughout the Republic, but this serious factor in citrus production is entirely neglected.

Beans (*Phaseolus* spp.) are extensively affected by anthracnose (*Colletotrichum lindemuthianum*), which causes losses up to 30 per cent. of the crop. Equally widespread, but less injurious, is powdery mildew (*Oidium erysiphoides*) [*Erysiphe polygoni*]. Mosaic disease also occurs widely. Pigeon peas (*Cajanus indicus*) are attacked by *Cercospora cajani*.

Septoria petroselini occurs on parsley. Chillis (*Capsicum annuum*) are slightly affected by *Gloeosporium piperatum* [ibid., v, p. 648] and *Meliola capsicola*.

Practically the whole of the Republic has now been invaded by Panama disease of bananas (*Fusarium cubense*), which caused severe losses in several localities during the period under review.

Gloeosporium musarum is also responsible for heavy losses in this crop.

Mosaic disease and leaf spot of tobacco (*Cercospora nicotianae*) are prevalent, but not severe.

Plasmopara viticola was observed on vine leaves in Mao.

Royal palms (*Oreodoxa* [*Roystonea*] *regia*) were attacked by a rot associated with *Botrytis vulgaris* [*B. cinerea*], and another destructive disease, probably of bacterial origin, is also under investigation.

Ylang-ylang (*Cananga odorata*) is extensively attacked in Haina by *Rhizoctonia* sp. and *Phytophthora* sp.

CIFERRI (R.). **Studien über Kakao. I. Untersuchungen über den muffigen Geruch der Kakaobohnen.** [Studies on Cacao. I. Investigations on the musty odour of Cacao beans.]—*Centralbl. für Bakt.*, Ab. 2, lxxi, 1–7, pp. 80–93, 1 fig., 1927.

Dried and fermented cacao beans in the Dominican Republic are frequently characterized by a mouldy or musty odour, which was found on examination to be associated with the presence of at least five species of *Actinomyces*, by far the commonest being a new variety of *A. albus* (var. α Cif.). The organisms occurred on the beans in numbers giving from 1,110 to 7,540 colonies per gramme, between 1,210 and 4,080 being constantly obtained from each gramme of the pericarp, and 530 to 1,120 from each cubic centimetre of the fermentation liquid. The spores remain viable, but inactive in the latter medium, probably on account of its high acidity. The fungi are disseminated from the soil by rain and wind, and their further development is favoured by defective methods of preparation, insufficient attention to cleanliness of the fermentation vessels, and other insanitary practices. By the adoption of precautionary measures the contamination of the beans can be reduced to a minimum. The producer cannot fairly be held responsible for any infection which may develop in transit as the result of humidity, warmth, or defective ventilation of the ship's hold. The musty odour may be largely eliminated by washing or preferably peeling the beans before preparation. Unfermented cacao beans yielded fewer *Actinomyces* colonies than fermented ones (320 to 1,230 per gm.).

Of the other fungi isolated in the course of these experiments, the following are of special interest: *Rhizopus arrhizus*, *Coniothecium effusum*, *Sterigmatocystis* [*Aspergillus*] *elegans*, a species of *Fusarium*, and *Spicaria lateritia* n. sp. [a diagnosis of which is given in German].

HERMANNES. **Rostbekämpfung mit chemischen Mitteln.** [Rust control by chemical methods.]—*Mitt. Deutsch. Landw. Gesellsch.*, xlii, 32, pp. 779–780, 1927.

The writer has obtained excellent results in the control of yellow rust of wheat [*Puccinia glumarum*], which caused exceptionally heavy damage in Germany in 1926 [*R.A.M.*, vi, p. 472], by sprinkling the plants, in May or early June, with unoiled calcium cyanamide at the rate of 80 to 200 kg. per hect. applied in the early hours (3 to 9 a.m.) with a System Schwabe apparatus (Gebr. Beyreuther, Zwochau). The highly susceptible winter wheat plants treated in

this manner lost practically every trace of rust and promised an excellent yield.

Conners (I. L.). **Seed treatment for cereal smuts.**—*Canada Dept. of Agric. Circ.* 56, N.S., 4 pp., 2 diags., 1927.

Instructions are given in popular terms for the control of the cereal smuts, which are stated to cause the annual loss of several million bushels of grain in Canada [*R.A.M.*, v, p. 535]. Bunt of wheat [*Tilletia tritici* and *T. levis*], oat smuts [*Ustilago avenae* and *U. levis*], and covered smut of barley [*U. hordei*] can be controlled by formalin (spraying, sprinkling, or immersion). Dusting with copper carbonate is effective only against wheat bunt and smut of hull-less oats. Directions are given for the construction of a simple barrel duster at an estimated cost of $ 10.

Güssow (H. T.) & Conners (I. L.). **Studies in cereal diseases. I. Smut diseases of cultivated plants and their control.**—*Canada Dept. of Agric. Bull.* 81, N.S., 79 pp., 15 figs., 5 diags., 1927.

This comprehensive survey of the smut diseases of cultivated plants is divided into three sections. Part 1 deals with such general aspects of the subject as the nature and effect of smuts, methods of spore dispersal, vitality of the spores and their persistence in the soil, factors influencing infection, varietal resistance of cereals, the occurrence of physiological forms, and the losses caused by smuts. In Part 2 descriptions are given of the common smut diseases of cereals and fodder grasses, their life-histories, and appropriate treatments for their control [see preceding abstract], together with similar notes on onion smut (*Urocystis cepulae*). A summary of the seed treatments is also given in tabular form. Botanical descriptions of the smut fungi are given in Part 3.

Neill (J. C.). **Stinking-smut of Wheat. V. Summary of three years' experiments on control, and detailed results for 1926–27 season.**—*New Zealand Journ. of Agric.*, xxxv, 1, pp. 28–34, 1927.

The combined results of the author's field experiments during the past three years upon the control of bunt (*Tilletia tritici*) in New Zealand [*R.A.M.*, v, p. 541] are given in tabular form, and summarized.

Treatment with copper carbonate dust gave satisfactory control of bunt, but resulted in the production of 4 per cent. fewer heads than were produced by the same weight of untreated seed. Clarke's wheat protector, 1 per cent. copper sulphate solution, and 1 to 480 formalin solution, all controlled the disease, but caused a decrease in the number of ears produced of 17, 20, and 18 per cent., respectively. Most of the decrease which followed treatment with formalin occurred in 1925, when the seed was allowed to dry thoroughly after treatment, and before sowing. Treatment with 2 per cent. copper sulphate and that with 1 to 320 formalin resulted in a decrease in ear production of 24 and 27 per cent., respectively. Semesan, uspulun, and germisan gave good but incomplete control of bunt,

with slightly increased ear production. None of the above treatments was completely successful in all three seasons.

During 1926–7 five different makes of copper carbonate were used, of which one, Corona, contained approximately 18 per cent. copper, and the remainder from 40 to 50 per cent. These were applied at the rate of 2 oz. per bushel. All completely eliminated bunt but caused a slight drop in germination and in the number of heads produced, as compared with the controls. No significant difference was shown by any of the brands. A new preparation of colloidal copper made by the Pittsburg Plate Glass Co., Newark, New York, gave results similar to those obtained with copper carbonate, but less complete disinfection. Semesan dust failed to eliminate bunt, but used as a 0·2 per cent. solution in which the seed was steeped for one hour at room temperature, it gave complete disinfection. A 0·25 solution of uspulun used as a steep in the same way gave complete control, with a slight improvement in germination. Clarke's wheat protector gave complete control, but caused a considerable drop in germination. Treatment with copper sulphate solution completely controlled bunt, but reduced the plants by 44 per cent. and the heads by 35 per cent. as compared with the controls. Treatment by steeping in 1 to 320 formalin completely controlled the disease, but lowered germination and heads by about 10 per cent.; while a 1 to 480 formalin steep gave equal control, and lowered germination and heads by only 1 to 2 per cent. Hot water treatment proved ineffectual.

A striking feature of these experiments is said to be the apparently unaccountable variation in the percentage of plants showing smutted heads when grown from seed-grain dusted with equal amounts of smut spores.

NAGEL (W.). **Das Schnellbeizverfahren. Ein Verfahren zum Beizen von Saatgut ohne nachfolgende Trocknung im Vergleich mit anderen Beizverfahren.** [The rapid disinfection process. A process of seed disinfection without subsequent drying compared with other methods of treatment.]—*Angew. Bot.*, ix, 4, pp. 420–451, 1 diag., 1927.

After explaining the principles of the rapid disinfection process (involving the use of small quantities of liquid for the treatment of seed) [*R.A.M.*, vi, p. 475], and comparing it with other methods, especially dusting, the writer gives a detailed account, accompanied by tables, of his experiments in the control of bunt (*Tilletia tritici*) on wheat.

It was found that, using 100 kg. of seed, the *dosis curativa* (*c*) of segetan 104 b (with which most of the tests were carried out) is 25 c.c. per 3 l. of water and the *dosis toxica* (*t*) 30 c.c. per 3 l. The corresponding figures for 40 per cent. formaldehyde are 20 c.c. per 3 l. of water both for *c* and *t*. It is apparent from these data that formaldehyde is not suitable for the rapid method of treatment, and similar objections apply to germisan and uspulun. Segetan 104 b is eminently satisfactory as regards toxicity and absence of ill effects on germination, but its acid content would corrode the seed treating apparatus on frequent use. Attempts should be made

to produce a disinfectant satisfying the requisite conditions of the rapid method of treatment.

The author introduces a new term, *dosis optima* (o), which is the dose giving the greatest stimulation to the germinative energy of the seed.

The advantages of the new process are summarized. They consist, *inter alia*, in rapidity of operation (30 to 60 cwt. of wheat seed-grain, i. e., sufficient to cover an area of 50 to 100 acres, can be treated in a day in an apparatus holding 0·5 to 1 cwt.); economy effected by the use of relatively small amounts of the disinfectant and by the omission of drying; the protection against reinfection afforded by the incrustation of the seed with a highly concentrated fungicide; the double fungicidal action (firstly at the time of treatment and secondly at the moment of sowing, when the seed comes into contact with the moisture in the soil); and the stimulatory effect of the treatment, especially in the case of preparations having their *dosis optima* approximately mid-way between the *dosis toxica* and the *dosis curativa*.

In conclusion the writer describes the construction and application of a simple apparatus for use in this process of disinfection, consisting of a cylinder measuring 75 by 45 cm. in diameter which is placed on a stand 80 cm. in height. It is estimated that 0·6 cwt. of seed-grain can be treated in ten minutes with this contrivance.

TAPKE (V. F.) & MEIER (F. C.). **Copper-carbonate seed treatment for stinking smut of Wheat.**—*U.S. Dept. of Agric. Misc. Circ.* 108, 3 pp., 1 fig., 2 diags., 1927.

This leaflet gives brief directions for the treatment of wheat seed-grain with copper carbonate dust against stinking smut [*Tilletia tritici* and *T. levis*] and also describes how to make simple types of dust mixers from an ordinary oil-drum and from a barrel, respectively.

VOLK (A.). **Weitere Aktivierungsversuche mit Trockenbeizen.** [Further activation experiments with dusts.]—*Fortschr. der Landw.*, ii, 14, pp. 457–461, 1927.

Following up Schaffnit's observations on the dependence of the efficacy of dusts on external factors [*R.A.M.*, v, p. 478], the writer carried out a series of experiments at Bonn on the influence of different seed, water, and soil relations on the efficiency of various preparations in the control of *Tilletia* [*tritici*] on summer and Krafft's Dickkopf winter wheat. The results of the tests [which are fully described and tabulated] show that, in the case of summer wheat, the best fungicidal action was obtained in loose sandy or peat soils at 20 per cent. of the water-holding capacity. The toxicity of the preparations declined with an increase in the humidity of the soil up to 80 per cent., and also with watering after sowing at a rate corresponding to 15 mm. of rain. In clay soil the effects of humidity were less noticeable, partly on account of its greater absorptive and adsorptive properties, and in part because of the increased activation of the fungicide due to pure chemical or colloid-chemical reactions.

These data clearly support the view already expressed [loc. cit.] that favourable results with dusts are mainly to be anticipated in regions with a continental climate and in summer experiments. The conditions promoting the activation of dusts are as favourable for autumn sowing in the principal wheat-growing areas of the United States and Hungary as they are for the spring sowing in Germany—if not more so. On the other hand, the high degree of humidity prevailing in Germany during the period of autumn sowing may prevent equally favourable results with winter wheat.

Of the twenty dusts tested for bunt control in winter wheat grown in clay soil (*a*) on level ground and (*b*) in a depression becoming waterlogged after rain, only tutan and höchst [tillantin], applied at the rate of 200 and 300 mg., respectively, per 100 gm. of seed-grain, gave equally good results in both cases (absolute elimination of infection, compared with 56·68 and 28·89 per cent. of diseased plants in two untreated plots). The higher percentage of infection in the control plots occurred on early sown plants (22nd October), when the soil temperature was 11·8° C. compared with only 5·6° on the 26th. Adequate control was also given by abavit, abavit B, segetan dust, porzol 26 H, and 225 and 998 dusts. With regard to the rate at which the preparations are applied, the quantity should be calculated so that it will be completely taken up by seed with an average water-content of 15 per cent. In view of the risk of an overdose, preference should always be given to those fungicides which can be applied in excess of the *dosis curativa* without injury to germination.

PETIT (A.). **Poudrage des semences contre la carie et les charbons externes. Substances et doses à employer.** [Dusting of seeds against bunt and smuts. Materials and quantities to be used.]—*Bull. Agric. Algérie-Tunisie-Maroc*, 2nd Ser., xxxiii, 6, pp. 114–117, 1927.

A series of experiments has been carried out by the Botanical Service in French North Africa to determine the relative efficacy of a number of dust treatments in the control of wheat bunt [*Tilletia tritici* and *T. levis*]. The results [which are given in tabular form] showed that copper chloride dust was as effective as any of the well-known liquid treatments, and far surpassed as a fungicide all the other dusts tested, including anhydrous copper sulphate, copper carbonate, neutral acetate of copper, oxychloride of copper, and copper arsenate. In each case, 250 gm. of dust was used to 1 quintal of seed [approximately 2·4 oz. per bush.].

Until copper chloride dust is obtainable commercially by growers, the author recommends that seed-grain which is only slightly infected should be treated annually with one of the following dusts, 200 to 250 gm. being used for each quintal of seed : neutral acetate of copper, copper oxychloride, or copper carbonate. Seed containing more than 1 in 200 parts by weight of spores should be treated in two successive years with well-pulverized, anhydrous copper sulphate dust, 250 gm. per quintal. This dust should be kept in airtight receptacles until required for use.

TISDALE (W. H.), LEIGHTY (C. E.), & KOEHLER (B.). **Further studies on flag smut of Wheat.**—*U.S. Dept. of Agric. Circ.* 424, 12 pp., 1927.

Further investigations on flag smut of wheat [*Urocystis tritici*: *R.A.M.*, iii, p. 129] carried out by the authors showed that spores of *U. tritici* lived for a whole year in infected straw buried in the soil, and were then capable of causing infection of wheat. Seed disinfectants, including copper carbonate and other dusts, prevented infection of wheat by spores carried on the seed, but did not satisfactorily control the disease if the soil was infected. The following varieties of soft red wheats proved either immune or highly resistant: China, Forward, Fulcaster (including Stoner), Fulhio, Gladden, Mammoth Red, Pennsylvania 44, Portage, Red Rock, Rudy, Shepherd, and Penquite (Velvet Chaff).

One red-chaffed selection made in a field of rosette resistant Harvest Queen, and also three selections of Salzer's Red Cross, remained free of smut in field tests at Granite City, Illinois, during four years' observations, while five rosette resistant Harvest Queen selections made in 1924 were still free from smut after two years. When these nine selections were subjected to greenhouse tests made with artificially smutted seed-grain during the winter of 1926–7, the selection No. 22–185 (from Salzer's Red Cross) produced 5·1 per cent. smutted plants, while Nos. 22–187 (from the same) and 24–26 (from Harvest Queen), gave 21·1 per cent. and 9·1 per cent., respectively, the remainder being free from the disease.

ZIMMERMANN (F.). **Die exakte Darstellung der Beeinflussung der Samenkeimung durch Beizmittel.** [The exact representation of the influence of disinfectants on seed germination.]—*Fortschr. der Landw.*, ii, 11, pp. 341–343, 2 graphs, 1927.

The writer explains a new system for the accurate evaluation and representation by graphs of the influence of various fungicides on the germination of seed grain. Using this method in comparison with that originally evolved by Gassner [*R.A.M.*, ii, pp. 554 et seq.], he tested the effect on the germination of rye of five preparations for the control of *Fusarium* [*Calonectria graminicola*]. Taking 100 as the index figure for the untreated controls, the following values were obtained by Gassner's method: abavit B 145·1, höchst [tillantin] 135, oderberg T 142·9, merck 143·9, and liquid uspulun 147·9. It would appear from these data that the effects of merck approximate to those of abavit B and oderberg T, but in the improved method the graph shows that this idea is misleading, since germination is both reduced and retarded by this preparation.

The graphic method of representation has the further advantage of permitting the comparison of two separate experiments conducted at different times and under varying conditions.

The writer tested the effect of various preparations on the germination of wheat seed-grain sown immediately and after storage. The first experiment was carried out from 21st October to 2nd November, 1925, and the following values were obtained, taking the germination of the control as 100: abavit B 96·7, abavit C 102·4, porzol 109·3, uspulun 108·5, tutan 87·2, agfa 104·6, and höchst [tillantin] 99·6. In the second test, carried out on grain

from the same lot from 8th to 21st October, 1926, the germination figures were as follows: abavit B 100·7, abavit C 119·6, porzol 118·4, uspulun 125·8, tutan 97·2, agfa 122·5, and höchst 113. It is apparent from these data that the use of treated seed-grain after storage for a year can safely be permitted.

WÜRTENBERGER (R.). **Das Auftreten von 'Typhula graminum' in Wintergetreidebeständen.** [The occurrence of *Typhula graminum* in winter cereal crops.]—*Illus. Landw. Zeit.*, xlvii, 26, p. 348, 1927.

Towards the end of March, 1927, the writer detected the small brown sclerotia (0·5 to 2 mm. in diameter) of *Typhula graminum* [*R.A.M.*, vi, p. 463] in winter rye and barley crops at Ratzebuhr, Pomerania. The affected barley plants showed a pronounced yellow discoloration, while the rye was poorly developed, but not much discoloured. In both cases the resultant injury was severe, and often fatal. Top dressings of sodium nitrate, leuna saltpetre, and sulphate of ammonia, accompanied by thorough hoeing and harrowing, are officially recommended for the control of this disease.

ROSEN (H. R.). **Bacterial stalk rot of Corn.**—*Arkansas Agric. Exper. Stat. Bull.* 209, 31 pp., 3 pl., 5 figs., 1926. [Received October, 1927.]

In addition to the information on bacterial stalk rot of maize (*Phytomonas dissolvens* comb. nov.) [*Bacterium dissolvens* in Migula's classification] previously published [*R.A.M.*, v, p. 544], this paper contains supplementary data on the motility of the organism. The previous statement that the bacterium is motile by means of a single polar flagellum must be revised in the light of further observations, which have shown that some strains are non-motile. Typical infections have been produced by both motile and non-motile strains.

KOEHLER (B.). **Studies on the scutellum rot disease of Corn.**—*Phytopath.*, xvii, 7, pp. 449–471, 6 figs., 1927.

Scutellum rot [*R.A.M.*, v, p. 225] is a very common disease of dent maize (*Zea mays indentata*), and occurs also in several other varieties. In its typical form the disease is caused by external infection by various organisms after the kernel begins to germinate and the seed-coat has been ruptured. On the germinator the most common causal agents of scutellum rot in the central corn belt are *Rhizopus* spp., the following having all been proved by inoculation to be capable of producing varying degrees of infection at temperatures of 16°, 22°, and 30° C.: *R. chinensis*, *R. arrhizus*, *R. reflexus*, *R. microsporus*, *R. pyriformis*, *R. nodosus*, *R. nigricans*, *R. tritici*, *R. maydis*, *R. artocarpi*, *R. oryzae*, and *R. delemar*. The initial attack usually occurs in the epithelial region of the scutellum, but often takes place also at other points.

Isolations from *Rhizopus*-infected kernels on the germinator showed that *R. tritici* and *R. nodosus* predominated under the conditions of the tests. Infection with *R. nigricans* was not found naturally. Species of *Mucor*, *Penicillium*, and *Fusarium* were the most prevalent organisms associated with the scutellum rot that

was found when susceptible seed was sown in soil at 16° and examined 30 days later, while *Gibberella saubinetii* and *Aspergillus niger* were also isolated. Only about 10 per cent. of the diseased kernels showed *Rhizopus* infection in this case.

Immature seed was found to be more susceptible to scutellum rot than mature seed, the starchy endosperm of the former probably being largely responsible for this tendency. In mature, field-selected seed-maize, the starchy ears were more susceptible to scutellum rot than those with horny endosperm. Slow drying of maize at outdoor temperature compared with rapid drying at warmer temperatures failed to influence resistance or susceptibility.

During the germination process, especially after the rupture of the pericarp, substances diffuse from the kernels (both resistant and susceptible) into the surrounding water. In the case of the susceptible kernels, the extract obtained by the diffusion process was a suitable medium for the vigorous growth of *Rhizopus*, whereas that from the resistant seed permitted only a very poor development. Thus, the substances emanating from germinating susceptible kernels seem to stimulate active growth of certain organisms on the exterior of the kernel or in the surrounding soil. These would develop most rapidly in the direction of the greatest concentration of the food substances diffusing from the kernel at the point of rupture of the pericarp. No quantitative difference was found between the substances extracted by diffusion from the susceptible and resistant kernels, and it is concluded that the difference must be of a qualitative nature.

Dungan (G. H.). **The influence of plant injury and the root rot diseases upon the physical and chemical composition of Corn grain.**—*Illinois Agric. Exper. Stat. Bull.* 284, pp. 254–281, 4 figs., 5 graphs, 1926. [Received September, 1927.]

The inoculation of inbred Illinois maize seed at planting time with the root rot organisms, *Diplodia zeae, Fusarium moniliforme* [*Gibberella moniliformis*], *G. saubinetii*, and *Rhizopus* sp., resulted in the production of grain having a specific gravity 0·027 lower than that from the adjoining controls. The samples of grain yielded by the plants growing in the inoculated hills absorbed an average of 5·78 per cent. more water than those in the control series. Chemical analyses showed no significant differences between the grain produced in the inoculated and uninoculated hills.

Park (M.). **On the occurrence on Coconut of Rhizoctonia bataticola (Taub.) Butler.**—*Trop. Agriculturist*, lxix, 1, pp. 7–8, 1927.

This is a preliminary note to record the discovery in 1927 in the Mannar district of Ceylon of *Rhizoctonia bataticola* [*Macrophomina phaseoli*: *R.A.M.*, vi, p. 757] in association with a root disease of the coco-nut. The symptoms of disease on the young palms, which are situated on low-lying, very sandy, dry, and poor soil, with pools of brackish water in the vicinity, were a yellowing and subsequent death of the outer leaves which progressed inwards, dwarfing of the central leaves, and, in extreme cases, a rotting of the central bud, followed by the death of the tree. A study of the

roots taken from trees in various stages of the disease showed the presence of sclerotia of *R. bataticola* on the majority of the dead roots; in the primary roots the sclerotia were very numerous on the inner surface of the cortex, embedded in the tissue of the latter, while in the small secondary roots the sclerotia were found scattered irregularly throughout the cortical tissues. The evidence so far collected tends to show that *R. bataticola* is the causal agent of this disease of the young palms, the more so as no other wood parasites were isolated from the diseased tissues, and experiments are in hand to test the pathogenicity of the fungus on the coco-nut palm.

SINGH (J.). **A study of Fusaria common to Cotton plants and Cotton soils in the Central Provinces.**—*Mem. Dept. Agric. India*, Bot. Ser., xiv, 6, pp. 189–198, 3 pl. (1 col.), 1927.

In this paper, the author describes four distinct strains of *Fusarium* isolated from wilted cotton plants received from parts of the Central Provinces and Berar (India). One strain is considered identical with the Dharwar *Fusarium* [*R.A.M.*, v, pp. 489, 594; vi, p. 226], and was similar to strains I and II of the *Fusarium* described by Ajrekar and Bal [ibid., i, p. 292]. These latter are stated probably to be identical, as the difference in the colour of their sclerotia is held to be unimportant.

Seven distinct strains of *Fusarium* were isolated from samples of 'wilted' and 'non-wilted' cotton soils; three of these, which resembled three strains obtained from wilted cotton plants, were found to be common to both types of soils, while one strain each was isolated only from non-wilted and wilted soils, respectively, and two strains were isolated only from a field in Nagpur where wilt had recently occurred. An eighth strain was isolated only from some wilted cotton plants from Nagpur.

Inoculation experiments [which are described] were conducted with all these strains, during the cotton seasons of 1924–5, 1925–6, and 1926–7. None of the inoculated plants wilted.

Six months after the soil had been infected, the fungus which had been used for the inoculations was reisolated, showing that the *Fusarium* had remained viable in the soil, but was incapable of infecting plants sown therein.

GRIGORAKI (L.). **Sur un nouveau dermatophyte du genre Aleurisma.** [On a new Dermatophyte of the genus *Aleurisma*.]—*Comptes rendus Soc. de Biol.*, xcvii, 23, pp. 492–493, 1927.

The writer isolated, from sycosiform and erythemato-squamous lesions on the beards and faces of two brothers at Lyons, a fungus with rounded spores, measuring 2 to 3·5 μ, and chlamydospores. The cultural characters of the organism are briefly described: gelatine is dissolved and milk coagulated. In Van Tieghem cells the spores emit one to five germ-tubes, which develop into slender, septate hyphae of uniform diameter. Rounded or oval bodies, resembling arthrospores, are occasionally observed. A large number of ramifications terminating in short, slender conidiophores are formed after a few days, and conidia are produced in clusters or occasionally in chains. The fungus has been determined as a new species of *Aleurisma*, *A. guilliermondi* [cf. *R.A.M.*, vi, p. 95].

STORM VAN LEEUWEN (W.), EINTHOVEN (W.), & KREMER (W.). **The allergen-proof chamber in the treatment of bronchial asthma and other respiratory diseases.**—*The Lancet*, ccxii, 5416, pp. 1287–1289, 1927.

A description is given of the construction and adaptation of the allergen-proof chambers used by the writers at Leyden (Holland) in the treatment of climatic asthma associated with infection by *Aspergillus fumigatus* and other organisms [*R.A.M.*, vi, p. 486].

LEWIS (I. M.) & WATSON (ELIZABETH). **A bacterial disease of Bowlesia.**—*Phytopath.*, xvii, 7, pp. 507–512, 1 fig., 1927.

Bowlesia septentrionalis, an annual caulescent herb belonging to the Ammiaceae [Umbelliferae], was recently observed to be affected by a bacterial disease near Austin, Texas. Infected leaves show numerous, frequently marginal, water soaked lesions, which rapidly turn almost black. In advanced stages of the disease the spots assume an irregular shape and the tissue dries out, becoming reddish-brown. When the petiole is infected the entire leaf withers, and often the lobes are completely destroyed.

The organism isolated from diseased leaves and cultured on a variety of media is a short rod with rounded ends, borne singly, in pairs, or in very short chains; it is actively motile by means of two to five bipolar flagella; produces green fluorescent pigment; liquefies gelatine and blood serum; coagulates milk and digests casein; produces hydrogen sulphide, ammonia, and indol; grows in Cohn's, Uschinsky's, and Fermi's solutions; has an optimum temperature of 27° C., a minimum of –1°, a maximum of 35°, and a thermal death-point of 49°; resists desiccation for four days; stains with basic aniline dyes; is non-acid-fast and Gram-negative; and grows best at a reaction of P_H 7·2, the minimum limit for growth being 4·5, and the maximum, 8·6.

This organism differs in various particulars from other known yellow fluorescent plant pathogens, and is therefore named *Phytomonas bowlesii* n. sp. Needle-prick inoculation experiments with a water suspension of the organism on *B. septentrionalis* gave positive results.

TAKIMOTO (S.). **Bacterial disease of Petasites.**—*Ann. Phytopath. Soc. Japan*, ii, 1, pp. 53–56, 1927.

In 1921–3 the writer studied a bacterial disease of *Petasites japonicus* in several different localities. The leaves of affected plants showed circular, brown spots, gradually becoming enlarged and irregularly elongated, and finally turning black. On the under surface the lesions were at first dull green or dark purplish-brown, later dark brown. A hitherto undescribed bacterium, which is named *Bacterium petasitis* n. sp., was isolated from diseased material.

The organism [an English diagnosis of which is given] is a short rod with rounded ends, motile by means of a polar flagellum, occurring singly or in pairs, and measuring 1·1 to 1·7 by 0·8 to 1 μ; Gram-negative, staining readily with gentian violet or methylene blue; producing circular or amoeboid white colonies on beef agar; reducing nitrates, forming gas, and coagulating milk, but not lique-

fying gelatine. The *Bacterium*, which grew well in Uschinsky's solution, developed best at 27° to 30° C., the maximum temperature for growth being 47° and the thermal death-point 55° to 56°; it is resistant to desiccation (but destroyed by three hours' exposure to bright sunlight), and remains viable for eleven months on beef agar.

SCHWARZ (M. BEATRICE). **Oidium verbenae nov. spec. (meeldauw van Verbena laciniata).** [*Oidium verbenae* n. sp. (mildew of *Verbena laciniata*).]—*Indische Culturen* (*Teysmannia*), xii, 12, pp. 470–471, 1 fig., 1 graph, 1927.

The well-known ornamental plant, *Verbena laciniata*, has been observed to suffer from mildew in the Buitenzorg district of Java. The upper and under surfaces of the leaves, as well as the stems, are covered with a white powder, the affected parts of the stem being often somewhat thickened and greyish in colour. The mycelium of the fungus is superficial, and bears long chains of elliptical or oval conidia, the average dimensions of which (calculated by the biometric method) [*R.A.M.*, iv, p. 315] were 33·89 by 17·43 μ with extremes of 26 to 46 by 14 to 22 μ. No perfect stage having been found, the fungus is referred to the genus *Oidium* as a new species, *O. verbenae*, a diagnosis in Dutch being given [but see *O. verbenae* Thüm. et Bolle, 1885].

ROBERTS (J. W.) & DUNEGAN (J. C.). **Critical remarks on certain species of Sclerotinia and Monilia associated with diseases of fruits.**—*Mycologia*, xix, 4, pp. 195–205, 1927.

With a view to arriving at a correct solution of the present confusion in the nomenclature of species of *Sclerotinia* and *Monilia* associated with diseases of fruits in Europe and America, the authors propose the following taxonomic dicta. (1) To be valid, names of species must be accompanied by adequate descriptions, properly published. (2) Assumptions that species of *Monilia* have species of *Sclerotinia* as ascogenous stages are permissible, but scientific names based on unknown ascogenous forms are not valid. (3) Whenever possible the connexion between a species of *Sclerotinia* and a species of *Monilia* must be demonstrated, if it is to be accepted.

A critical review of the existing literature on this subject [the more recent of which has from time to time been noticed in this *Review*], coupled with their own studies with the above dicta as a guide, has led the authors to reconsider the position taken by them in a previous paper [*R.A.M.*, iv, p. 175] in regard to the advisability of retaining *S. cinerea* as the name for the fungus that causes the common fruit rot in America. They now believe that two species occur on drupaceous and pomaceous fruits in America, namely: the common brown rot fungus, different from any known European form, the correct name for which, on grounds of priority, is *S. fructicola* rather than *S. americana* [ibid., vi, p. 619]; and the recently discovered *Monilia* form occurring along the Pacific Coast (*M. oregonensis* Barss) [ibid., iv, p. 487; v, p. 108], which is similar to and possibly identical with *Monilia* [*Sclerotinia*] *cinerea* of Europe, Barss's name being, in any case, a *nomen nudum*. No perfect stage of this fungus has been found in America. *S. fructi-*

gena is a valid name for the species which occurs in Europe, but is not known to occur in the United States.

SCHNEIDERHAN (F. J.). **Diseases of fruit and nut crops in the United States in 1925.**—*Plant Disease Reporter, Supplement* 47, pp. 167–299, 1926. [Mimeographed. Received November, 1927.]

A special feature of this report, which is prepared on the usual lines [*R.A.M.*, iv, p. 608], is a digest of noteworthy items contained in a summary, most of which have already been noticed from other sources.

The section on apple diseases comprises several pages of data relating to the prevalence of scab (*Venturia inaequalis*) in various States, and its connexion with the dates of ascopore emission [ibid., vi, p. 561].

Powdery mildew of apples (*Podosphaera leucotricha*) is generally of minor importance in the United States, but the highly susceptible Jonathan variety may be severely injured as the result of twig growth following the destruction of the terminal leaves.

Brown rot of peaches and plums caused by *Sclerotinia fructicola* (Wint.) Rehm (*S. americana* (Wormald) Norton & Ezekiel) [see last abstract] was less prevalent than usual, presumably on account of the dry weather.

The report contains numerous further records on the diseases of stone and small fruits, while the concluding section (contributed by H. R. Fulton) deals with those of citrus and other subtropical and tropical fruits, and of nuts.

GÜLL (A.). **Einige in diesem Frühjahr besonders stark verbreitete Obstbaumschädlinge.** [Some widespread fruit tree pests of the current spring.]—*Obst- und Gemüsebau*, lxxiii, 14, pp. 220–221, 1927.

The following diseases of fruit trees are reported to have been widely distributed in the Lichterfeld district of Berlin during the cold and damp spring of 1927. Leaf curl of peaches (*Taphrina deformans*) was unusually severe except on a few resistant varieties, including Proskau. Apricots were heavily attacked by *Sclerotinia laxa*, against which no reliable control measure is known. Apple mildew (*Podosphaera leucotricha*) was widespread on the Beauty of Boskoop, Gravenstein, Boiken, Landsberg, Baumanns, and Canada Reinette varieties.

JØRSTAD (I.). **Iakttagelser over rustsoppangrep i norske frukthaver.** [Observations on infection by rust fungi in Norwegian orchards.]—*Nordisk Jordbrugsforskning*, 4–7, pp. 694–697, 1926. [Received October, 1927.]

Gymnosporangium tremelloides, parasitic on apple trees, is stated to be the only fruit rust to have received attention in Norway until quite recently, when severe attacks by *G. clavariaeforme* on pears and by *Thecopsora areolata* on cherries pointed to the need for further investigation [*R.A.M.*, v, pp. 197, 198].

The serious shot hole disease caused by the last-named fungus has probably been erroneously referred in the past to *Clastero-*

sporium carpophilum, *Phyllosticta pruni*, or *Cylindrosporium padi*. Teleutospores do not seem to develop on the leaves of cultivated stone fruits, and even the uredospores are sparse or poorly developed on the affected areas. Wild sweet and Morello cherries, on the other hand, may show angular spots similar to those occurring on the bird cherry [*Prunus avium*], and in such cases the lesions do not always fall out, while the uredospores attain their normal development. Plums may also be heavily damaged by shot hole due to *T. areolata*, which is not believed to have been previously recorded on cultivated stone fruits outside Norway.

G. clavariaeforme has recently been observed to occur in a very severe form on pears, totally destroying the fruit. There seems to be no sufficient basis for the establishment of a separate biologic form of the fungus on pear as distinct from that occurring on hawthorn [*Crataegus*].

G. tremelloides is a serious parasite of apple leaves in the western fjord regions, where junipers (the alternate host of the fungus) grow on every mountain slope. The fruit is also frequently attacked, but as a rule little damage is caused, infection generally being restricted to the calyx end and the aecidial stage seldom developing. Recently, however, the writer received a consignment of apples rotted by *Gloeosporium fructigenum* [*Glomerella cingulata*] which had gained entry through the rust lesions.

WALLACE (R. H.). **The production of intumescences in Transparent Apple by ethylene gas as affected by external and internal conditions.**—*Bull. Torrey Bot. Club*, liv, 6, pp. 499–542, 1 pl., 2 diags., 1927.

Completing his earlier experiments [*R.A.M.*, v, p. 745], the author gives a detailed account of the production of intumescences on cut, woody twigs of Transparent apple exposed to a known concentration of ethylene gas.

There was no correlation between the percentage humidity of the air and the extent of the reaction to the gas. Light has no influence on the formation of intumescences.

The optimum growth of the intumescences occurred at about 15° C., and the highest temperature at which they formed was about 30°. A much larger relative number of cut twigs responded to exposure at the optimum than at higher temperatures. No reaction could be detected in the absence of oxygen or in the presence of 25 per cent. or more of carbon dioxide.

Exposure to concentrations ranging from 75 per cent. ethylene and 25 per cent. oxygen to 1 part ethylene and 10,000 parts air showed no definite differences in the responses. In concentrations of 1 part ethylene to 1,000,000 or 100,000,000 parts air the intumescences were less extensive and formed more slowly than in higher concentrations, but were distinct and characteristic. Exposures to a mixture of 1·5 per cent. ethylene and 98·5 per cent. air for periods ranging from 7·5 minutes to about a fortnight all gave responses, which showed no variation in the number or extent of the intumescences.

There was no evidence of any difference in the number and extent of the intumescences formed in different individuals of the

Transparent apple variety, nor did the season of the year appear to affect their sensitiveness.

A valuable bibliography of 44 titles is appended.

FOWLER (B.). **Autumn spraying of stone fruits.**—*Journ. Dept. Agric. South Australia*, xxx, 12, pp. 1218–1219, 1927.

Whilst stating that no very definite data can yet be given in regard to the advisability of spraying stone fruit trees in the autumn, the author cites the case of three Elberta peach trees at the Government Experiment Orchard at Blackwood, South Australia, two of which were sprayed with Burgundy mixture in the autumn and were comparatively free from leaf curl [*Taphrina deformans*] during the next season, although they were not sprayed again in the spring. The third tree, which did not receive the autumn spray, was badly diseased the following year, thus apparently demonstrating the efficacy of the autumn spray in the control of this disease. From a discussion of the life-history of prune rust [*Puccinia pruni-spinosae*] and of the shot hole organisms [*Clasterosporium carpophilum* and other fungi] he also believes that the treatment would be of great assistance in checking the spread of these diseases. The usual practice at the Government orchard is to apply 1–1–10 Burgundy mixture early in the autumn, before the leaves have finished falling.

HAASE. **Die Blattbräune der Süsskirschen in Oberbaden.** [The leaf scorch of Sweet Cherries in Upper Baden.]—*Obst- und Gemüsebau*, lxxiii, 14, pp. 213–215, 3 figs., 1927.

Attention is again drawn to the devastating effects of the leaf scorch (*Gnomonia erythrostoma*) in the cherry orchards of Upper Baden [*R.A.M.*, vi, p. 40]. During 1926 the trees were also heavily infected by *Clasterosporium carpophilum* and *Phyllosticta prunicola*, causing excessively early defoliation. It is estimated that in many of the orchards 60 to 70 per cent. of the stand has been ruined, while the loss over the entire affected area must amount to at least Mk. 200,000 to 300,000. Attempts are in progress to save the remainder of the trees, but so much time was lost in the early stages of the epidemic that the prospects are not very hopeful. The writer has obtained good control by two or three applications of Bordeaux mixture or nosprasen, accompanied by drastic pruning and plentiful applications of manure. The condition of the trees has further been improved by dormant applications of carbolineum. [A similar account has also appeared in *Nachricht. über Schädlingsbekämpf.*, ii, pp. 149–155, 4 figs., 1927.]

JØRSTAD (I.). **Sprøiteforsøk mot Stikkelsbærdreper i 1925 og 1926.** [Spraying experiments against Gooseberry mildew in 1925 and 1926.]—Reprinted from *Havedyrkingens Venners Medlemsskr.*, 2, 6 pp., 1927.

The results of further experiments in the control of gooseberry mildew [*Sphaerotheca mors-uvae*: *R.A.M.*, v, p. 167] in various parts of Norway are described and tabulated. The most effective treatment consisted in two summer sprays (one immediately after blossoming and the other a fortnight later), supplemented by a

dormant application shortly before the opening of the buds. Of the preparations tested, 2 per cent. sodium sulphide soap was most effective against mildew when applied only as a summer spray. Where the dormant application was also given, lime-sulphur (1 in 10 winter strength and 1 in 40, 80, or 120 summer strength) and common salt (4 per cent. winter and 2 per cent. summer strength) proved equally valuable, but both these materials showed a tendency to injure the foliage. Excellent results were given in one test by two summer applications of common salt and one dormant spray of 2·5 per cent. formalin.

RANKIN (W. H.). **Mosaic of Raspberries.**—*New York (Geneva) Agric. Exper. Stat. Bull.* 543, 60 pp., 8 pl., 1 fig., 1927.

This bulletin gives a detailed account in popular terms of investigations conducted at Geneva, New York State, upon mosaic disease of raspberries, varietal resistance to it, its transmission by *Aphis rubiphila* and *Amphorophora rubi*, and its control by roguing.

Mosaic of black raspberries [*Rubus occidentalis*], which are more susceptible to the disease than are the red varieties [*R. idaeus*], is stated to be caused by the same virus as the red raspberry mosaic: the disease is particularly prevalent when black varieties are grown near affected red raspberries. Leaf curl, which is a quite distinct disease, is of no practical importance in the State. The condition of *R. occidentalis* previously designated streak, bramble streak, or eastern blue stem [*R.A.M.*, ii, p. 128; vi, p. 675] is now suspected to be merely a form of mosaic; if distinct, it is at least commonly associated with the latter, and the same applies to the yellow form of the disease.

Aphis rubiphila and *Amphorophora rubi* are stated to be universally present on raspberry plants in New York during the entire season. Other species of aphids are so rare that infection from other crops is considered unlikely. *Aphis rubiphila* is very sluggish, and where this alone is concerned, mosaic is easily controlled by roguing; the larger species (*Amphorophora rubi*) is very active and produces winged forms in abundance, but only its first and second instars were found to be infective; the difference in infectivity between young and mature instars is stated to show that there is a variable biologic relation between the aphid and the virus, and that feeding forms of the insect are not a purely mechanical means of transmission. Insecticides did not give adequate control of infection.

Of twenty-eight varieties of red raspberries tested, the most resistant were Buckeye, Erskine Park, La France, Ohta, Sunbeam, Turner, Van Fleet, and Webster, and the most susceptible Count, Golden Queen, Herbert, Kevitt Hybrid, and Owasco. At Geneva, roguing reduced the annual infection of mosaic in the Herbert, Cuthbert, June, and Ontario varieties to less than 2 per cent., but stock of the three last-named varieties from the same sources showed from 10 to 30 per cent. infection after one season in rogued plots in the lower Hudson River Valley, where the spread of mosaic is usually very rapid. In a plantation of more than 35 red and purple [*R. neglectus*] varieties at Geneva, rogued for five seasons, the

mosaic incidence fell from 30 to about 4 per cent., and in the fifth season (1926) twenty-five varieties were disease-free.

The most promising varieties for cultivation in the lower Hudson River Valley are considered to be Latham and Ranere, while for central and western New York these are also indicated, together with Cuthbert, Herbert, June, Ontario, Columbian (purple), Cumberland (black), and Plum Farmer (black). These may be grown with little loss up to five years after planting. Less than 2 per cent. mosaic in the stock should give growers a chance to obtain a mosaic-free plot the second season after planting. Mosaic-free stock should not be planted within 200 ft. of other raspberries.

Control in western, central, and northern New York should consist in the use of mosaic-free stock, and in the roguing of standard varieties in the first two years, after which it is not profitable. Aphids must not be dislodged during roguing, and the solid-row system of planting should be adopted, the rows being spaced eight or nine feet apart.

Ruggles (A. G.) & Winter (J. D.). **Results of three years' experience in the control of mosaic in Red Raspberries in nurseries.**—*Journ. Econ. Entom.*, xx, 3, pp. 478–483, 1927.

Further data are given concerning the work of the Minnesota nursery inspection service in the control of raspberry mosaic by roguing [*R.A.M.*, v, p. 564]. Approximately 125 acres were inspected and rogued in 1925 and 175 acres in 1926, each individual bush being examined two or more times a year. The information obtained as a result of these surveys indicates a steady decrease in the prevalence of mosaic, even in the varieties showing a high percentage of infection at the inception of the work in 1923. A number of plantings are now apparently completely free from infection, showing that in Minnesota the control of raspberry mosaic by roguing is entirely practicable.

Müller (W.). **Ueber Mosaikerscheinungen an Himbeere.** [Mosaic conditions in the Raspberry.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 7, pp. 65–66, 1927.

Attention is drawn to the occurrence of raspberry mosaic in the Rhine Province, and probably in other parts of Germany. Affected plants show the typical symptoms of the disease [which are briefly described] as observed in America and elsewhere. The presence of leaf curl has not yet been detected in the localities inspected by the writer. Currants and blackberries are stated also to be frequently affected by mosaic.

Lanham (W. B.), Wyche (R. H.), & Stansel (R. H.). **Spraying for the control of Fig rust.**—*Texas Agric. Exper. Stat. Circ.* 47, 8 pp., 3 pl., 1927.

Much of the annual fig crop in the Gulf Coast section of Texas, where 16,200 acres of Magnolia figs are stated to be planted, is rendered unfit for market through attacks of fig rust (*Uredo* [*Kuehneola*] *fici*). Experiments begun during 1924–5 on orchards of this variety specially planted at the Experimental Substations at Angleton and Beaumont [Texas], in the course of which the

fruit was picked every day or two and a record kept of the yield of each tree, showed that a single dormant spray with Bordeaux mixture was ineffectual in controlling the disease, nor were one or two sprayings on the early foliage adequate. Leaves once covered with the spray did not fall prematurely, but new foliage appearing after the application was attacked, and dropped. More frequent sprayings [details of which are given] yielded good results.

The authors accordingly recommend that fig trees should be sprayed with 5–5–50 Bordeaux mixture immediately rust appears, and that spraying should be repeated at intervals of about thirty days (or even every fifteen days in wet seasons), until the last fruit has ripened.

GÄUMANN (E.). **Ueber eine Pestalozzia-Krankheit der Nussbäume.** [On a *Pestalozzia* disease of Walnut trees.]—*Mitt. Schweiz. Centralanst. Forstl. Versuchswesen*, xiv, 2, pp. 195–200, 2 figs., 1 diag., 1927.

In April, 1926, two-year-old walnut trees of Swiss origin were attacked at the Adlisberg (Zürich) Forestry Experiment Station by a leaf disease which subsequently assumed an alarming character.

The aerial organs of affected individuals showed no special distinguishing marks. The leaves became dry and curled up in a few days, but apart from spots produced by *Gnomonia leptostyla*, no trace of a parasite was apparent. The vascular bundles also appeared healthy, but the basal portions of the stems showed far-reaching alterations. Small necrotic areas, appearing on the surface as brownish spots, were observed in the bark of the root-collar immediately below soil level. They spread rapidly in a radial direction and converged, eventually causing a wilt of the young crown. Numerous intercellular (occasionally intracellular) hyphae occurred in the affected area and later penetrated the woody cylinder, where they caused a brown discoloration of the medullary rays and vessels, and (in summer wood) of the parenchyma. In advanced cases the infected parts of the central cylinder were obstructed by gummy secretions. Even at this stage there was little outward sign of disease, but the subsequent invasion of the root system by secondary organisms led to its complete decay within a few weeks. In the closing phase of the disease the spore layers of a *Pestalozzia* were regularly found, together with various other fungi.

In repeated isolations from the tissues of the diseased roots, the only fungus that was consistently obtained was the *Pestalozzia*, pure cultures of which were grown on oatmeal agar. Eight healthy two- to five-year-old walnut trees were inoculated with spore suspensions from these cultures. The typical symptoms of the disease were produced in five to seven days in every case, while the controls, and similar trees inoculated with some of the other fungi isolated, remained healthy until after several weeks, when some of them also showed signs of the disease, evidently as a result of natural spread from the inoculated plants. The *Pestalozzia* was constantly reisolated from the root-collars of infected trees, both those inoculated with it and those to which it had spread naturally,

and there seems to be no doubt that it is the primary cause of the leaf disease.

Oatmeal cultures of the fungus yielded a luxuriant yellowish-white mycelium, which on rice assumed a faint ochraceous or reddish coloration at the edges. The five-celled conidia measured 13 to 22 μ in length, the curve plotted from the measurements of a number of spores showing a distinct peak at 17 μ, and they were 3 to 8 μ in breadth with a peak at 5 to 6 μ. The middle cells were brown to dirty green, and there were generally three, occasionally two or four cilia. On the basis of these data the species in question would seem to be identical with *P. funerea*. In Miss Doyer's experiments [*R.A.M.*, v, p. 391], inoculation with this species gave negative results, but the author suggests that she was dealing with saprophytic strains since in the Swiss case the pathogenicity of the fungus was clearly demonstrated.

Further investigations showed that infection by *P. funerea* was greatly favoured by the character of the soil (a heavy diluvial clay) in the seed-beds. The symptoms of the disease were much less acute in trees transplanted to compost. In its close connexion with the nutritional relations of the host, this *Pestalozzia* disease presents an analogy with the heart rot of beets [ibid., iv, p. 521]. Its control should be based on the improvement of the physical properties of the soil, or on the selection of propagation-beds providing better nutritional conditions.

TRAPPMANN (W.). **Schädlingsbekämpfung. Grundlagen und Methoden im Pflanzenschutz.** [Pest control. Foundations and methods of plant protection.]—S. Hirzel, Leipzig, 440 pp., 59 figs., 9 diags., 1927.

This comprehensive general survey of the foundations and methods of plant protection comprises the following sections: (1) Importance and objects of plant protection. (2) General observations on plant pathology, including definitions and causes of disease and injury, relations between host and parasite, symptoms of disease, and the occurrence and distribution of pests. (3) The control of plant diseases and pests, in which are contained discussions on cultural operations (including selection and breeding resistant varieties), biological control, and control by physical and chemical methods. Under chemical methods are included short accounts of the principal insecticides and fungicides, relatively little space being given to the latter. This section further comprises notes on the respective merits of spraying and dusting, combined mixtures for the simultaneous control of diseases and pests, and a useful description of the construction and application of the different types of spraying and dusting apparatus. A valuable feature is the table showing the fourteen seed steeps passed for general use by the German Plant Protection Society (1st September, 1926), together with the name of the maker, the mode of application, and the diseases controlled. The active principles of these preparations are indicated. A list is also given of the fungicidal dusts hitherto recognized by the same authority.

The concluding sections of the work deal with the comparative value of the various methods of pest control discussed in the fore-

going chapters, and with the organization of control. A compilation of the principal pests and diseases forms a useful appendix to the book.

GRAM (E.). **Afsvampningsproblemer.** [Disinfection problems.]—*Ugeskr. for Landmænd*, lxxii, 27, pp. 417–419, 1927.

The writer reviews some of the more important problems of seed disinfection. Apart from those already noticed in this *Review* the following are of interest. For the control of loose smut of oats [*Ustilago avenae*] Jakowatz and Zimmermann (*Landw. Fachpresse*, 4, 1925) found germisan or formalin the most effective liquid preparations. In a later article (ibid., 6, 1927) the same writers point out the practical difficulties of immersion and report on the results obtained with various dusts in the control of oat smut. Abavit B and oderberg T proved most satisfactory (2 and 6 smutted ears per are, respectively, compared with 70 in the untreated plot). Tillantin and abavit C were moderately effective (19 and 10 smutted ears), while porzol, merck, and tutan proved useless.

Writing in Weibull's year-book for 1927, Hammarlund draws attention to the difficulty of disinfecting against oat smut. In his experiments only germisan, tutan, and the hot water treatment gave adequate control: abavit B, formalin, tillantin C, germisan 225, uspulun, tillantin dust, rex, and uspulun dust were ineffectual, the last-named in particular. The untreated plots showed 33 per cent. infection.

Commenting on Stehlik's and Neuwirth's conclusion that root rot of beets [*Phoma betae, Pythium de Baryanum*, and *Aphanomyces levis*] cannot be controlled by disinfection of the seed-clusters [*R.A.M.*, vi, p. 649], the author points to a number of successful Danish experiments in this direction [ibid., vi, p. 72]. There would seem to be every justification for a continuance of the practice of seed-cluster treatment where root rot is to be anticipated.

Marked differences of opinion exist in various countries, not only with regard to the choice of seed disinfectants, but also as to the best methods of application. Sprinkling with formalin is widely practised in Great Britain and Canada, while in Australia and the western United States the technique of dusting has been most successfully developed. In Germany, the original home of the dry method of disinfection, neither dusting nor sprinkling has won official approval, though both are extensively used. Both in Holland and Germany attempts are in progress to combine the advantages of sprinkling and dusting by the use of small quantities of liquid [see above, p. 24].

STREETER (L. R.). **Physical properties of commercial dusting and spraying materials.**—*New York (Geneva) Agric. Exper. Stat. Bull.* 125, 12 pp., 1927.

In sifting sulphur in order to determine its suitability for dusting, evidence was obtained of the development of frictional electricity which impeded passage, but mixed dusts containing sulphur and lead arsenate were found to be electrically neutral. Lead arsenate and sulphur were therefore prepared for sifting by mixing 6 gm. of the former with 36 gm. of sulphur. Dusts so prepared

were easily passed through a 325-mesh sieve (i.e., the particles were less than 44 μ in diameter), which the author considers a satisfactory test for dusting and spraying purposes. Other materials tested for mixing with sulphur included the following: calcium arsenate, kaolin, talc, slate dust, calcium borate, and bentonite. With a commercial sample of calcium arsenate, 14 per cent. of which passed through a 325-mesh sieve when screened alone, 96·2 per cent. passed through after being mixed with sulphur. The percentage of kaolin that passed through was similarly raised from 20 to 99·5, and that of slate dust from 14·3 to 99·2. It was found that all the materials named above could be mixed with sulphur in a definite proportion (usually 1 to 6), and easily screened.

BAILLY (A.). **Insecticides anticryptogamiques.** [Fungicidal insecticides.]—*Rev. Vitic.*, lxvii, 1723, pp. 8–10, 1927.

The author states that the insecticidal mixture of nicotine, petrol, and hydrocarbon derivatives developed by Hubert gives an exceedingly stable product, which can be kept even in open vessels for prolonged periods without losing its efficacy. He also states that an organic copper colloid can be added to the mixture, the resulting preparation having excellent physical properties which may make it of considerable value as a combined insecticide and fungicide.

NETOLITZKY (F.). **Ueber den Eigenschutz der Samen und Früchte gegen Desinfektionsmittel.** [On the self-protection of seeds and fruits against disinfectants.]—*Angew. Bot.*, ix, 4, pp. 415–419, 1927.

The writer explains the anatomical structure of seeds, with special reference to cereals, and points out that the inner cuticle affords efficient protection against the penetration of the embryo by most chemical disinfectants and stimulants applied at normal strength. This cuticle is least resistant to the passage of alcohol, ether, chloroform, benzine, ammonia, formaldehyde, and iodine. The reaction of the cuticle to various chemical substances has been described by van der Marel (Dissertation, Groningen, 1919).

ZWEIGBAUMOVNA (ZOFJA). **Wpływ arseninu sodu, sody oraz formaliny na kiełkowanie zarodników mączniaków.** [The influence of sodium arsenite, sodium carbonate, and formalin on the germination of *Oidium* spores.]—*Acta Soc. Bot. Poloniae*, iv (Supplementary Number), 10 pp., 1926. (French summary.) [Abs. in *Centralbl. für Bakt.*, Ab. 2, lxxi, 1–7, pp. 162–163, 1927.]

From 1922 to 1925 the author carried out a series of laboratory tests on the value of sodium arsenite, sodium carbonate, and formalin in the control of *Oidium erysiphoides* [? *Erysiphe polygoni*] on *Heracleum sphondylium* and [*Sphaerotheca humuli*] on hops; *O. leucoconium* [*Sphaerotheca pannosa*] on roses; *O. quercina* [*Microsphaera quercina*] on the oak; and *O. euonymi-japonicae* on *Euonymus japonica*.

The spores were found to germinate in all the solutions of sodium arsenite used against gooseberry mildew (*S. mors-uvae*), i. e., from

0·08 to 0·32 per cent., while 8 per cent. germinated in a solution of 2 per cent. sodium arsenite and 10 per cent. in a 2 per cent. solution of sodium carbonate. Even at concentrations of 10 per cent. sodium arsenite and sodium carbonate the spores germinated to the extent of 0·2 and 0·3 per cent., respectively, and it was only at concentrations of 15 per cent. of the former that germination was arrested. The germinative capacity of the spores was found to depend greatly on their degree of maturity, atmospheric factors, and the like. It was shown that the relative percentage of spores germinating in the fungicidal solutions is proportionate to that of the spores which germinate in water: the greater the germinative capacity of the spores, the weaker is the action of the solutions on them. In practice, formalin, which is very volatile and exerts only a slight action on the spores, does not seem to be an efficacious means of control of the mildews. Weak solutions of sodium arsenite do not retard spore germination, while strong ones burn the foliage of the plants. On the other hand, a solution of 1 per cent. sodium carbonate does not injure the leaves and has a certain effect in reducing the germination of the spores, so that it appears to be the most suitable for practical use.

GARVER (H. L.). **The stationary spray plant.**—*Washington Agric. Exper. Stat. Bull.* 212, 42 pp., 9 figs., 11 diags., 1927.

In the Wenatchee apple orchard district of Washington State the popularity of stationary, as opposed to portable, spray plants [*R.A.M.*, vi, pp. 304, 305] is stated to be steadily increasing. The principles of construction [which are explained] are similar in both types of plant, but the stationary has many advantages over the portable both as regards facility of application and economy. It is roughly estimated that the labour saving resulting from the use of the stationary plant is from one-third to one-half compared with the portable apparatus. Where electricity is available, it is undoubtedly the best form of power for driving stationary plants. Pressure is maintained by specially designed relief valves which allow the overflow to return to the tank against practically no pressure when no material is flowing through the guns or other apertures. High pressure (350 lb. and above), though not essential to the efficacy of the spraying operations, increases efficiency and accelerates the process. Two systems of piping are in common use, i. e., the return and dead end. In both cases the pipes may be underground, on the surface, or overhead.

THOMAS (H. E.). **Some chemical treatments of soil for the control of damping-off fungi.**—*Phytopath.*, xvii, 7, pp. 499–506, 1927.

The application to the soil of copper carbonate, mercuric chloride, and uspulun controlled damping-off of tomatoes caused by two strains of *Phytophthora* [unspecified] in a series of experiments carried out at Ithaca, New York. *Corticium vagum* [*C. solani*] in cabbage and tomato plantings was effectively controlled by the mercury compounds, but copper carbonate and two forms of colloidal copper were of little use. The mercury compounds caused injury to the stems and foliage of tomatoes at concentrations which were harmless to cabbage (1 in 1,600 mercuric chloride and 1 in

400 uspulun). Treatments applied after the appearance of damping-off were of little value either with tomatoes or cabbage. No evidence of chemical stimulation was obtained in any of these experiments.

FERRARIS (T.). **Trattato di patologia e terapia vegetale ad uso delle scuole di agricoltura.** [Treatise on vegetable pathology and therapy for the use of agricultural schools.]—3rd, completely revised, Ed., vol. ii, pp. i–viii and 641–1264, 3 pl., 103 figs., Milan, Ulrico Hoepli, 1927.

This volume completes the third and completely revised edition of Ferraris's treatise on the pathology and therapy of cultivated plants, the publication of the first volume of which has already been noticed [*R.A.M.*, v, p. 173]. In it are discussed diseases caused by the Ustilaginales, Uredinales, and other Basidiomycetes; Fungi Imperfecti; algae; lichens; and phanerogamic parasites. An elaborate key, extending to 70 pages, is furnished for the determination of diseases by their hosts and external symptoms and a full index of 30 pp. is appended.

ADAM (D. B.). **Plant pathology. Studies in Europe and America.** —*Journ. Dept. of Agric. Victoria*, xxv, 1, pp. 1–6; 2, pp. 85–90; 4, pp. 235–238; 5, pp. 257–261; 6, pp. 359–366; 9, pp. 540–545, 4 figs., 1927.

In this paper the author reports his observations made during a voyage of studies in Europe and America on various aspects of phytopathology, the data being arranged under six general headings as follows. (1) The resistance of plants to disease; (2) the potato degeneration diseases and seed certification; (3) horticultural conditions, with particular reference to the control of diseases in (*a*) the Eastern American States and (*b*) the Pacific Coast States; (4) cool storage and related investigations in England and America; (5) English and Continental institutions for the investigation of agricultural problems; and (6) specialized American institutions, viz., the Citrus Experiment Station at Riverside, California, and the Hawaiian Sugar Planters' Association Experiment Station, Honolulu.

Section (1) is illustrated by brief accounts of the resistance of maize to seedling blight (*Gibberella saubinetii*); of wheat to rust [*Puccinia* spp.]; of potatoes to late blight [*Phytophthora infestans*]; and of pears to fireblight [*Bacillus amylovorus*].

Section (2) deals with mosaic and leaf roll of potatoes and with the systems of seed selection and certification practised in the United States, with special reference to Wisconsin and Minnesota.

Under (3) a detailed account is given of the organization and methods of the New York State Spray Information Service, with special reference to the control of apple scab (*Venturia inaequalis*), the loss from which in that State alone amounted to 6,346,000 bushels in 1924.

The question of cool storage is discussed in section (4) mainly from the standpoint of the factors determining the deterioration of the fruit, and the means of maintaining it in a sound condition for the requisite period of storage. A brief account is given of the work in progress in England and America on various fundamental

problems of storage; of the Oregon investigations on the estimation of the correct time for picking by means of the pressure tester; of the method employed in Washington for the storage of raspberries and other small fruit; and of the storage of lemons in California.

In section (5) a concise outline is given of the work pursued in connexion with various agricultural and horticultural problems at the experiment stations of Rothamsted, East Malling, Cheshunt, Lausanne, and the Biologische Reichsanstalt, Berlin.

In the concluding section of his paper the author describes the work carried on (*a*) at the Citrus Experiment Station, Riverside, California, with special reference to the control of *Pythiacystis* [*Phytophthora citrophthora*: *R.A.M.*, v, p. 296]; and (*b*) by the Hawaiian Sugar Planters' Association, of which one of the most valuable activities in the past is stated to have been the raising of the disease-resistant H 109 variety of sugar-cane.

SCHLUMBERGER [O.]. **Saatenanerkennung und Pflanzenkrankheiten im Jahre 1926.** [Seed certification and plant diseases in the year 1926.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 7, pp. 61–62, 1927.

The work of seed certification in Germany during 1926 was conducted on the same lines as in previous years [*R.A.M.*, iv, p. 640], and the results of inspection of the various crops in all areas except Thuringia and Anhalt are here tabulated and briefly discussed.

Of the entire area inspected, comprising over 166,952 hect., certification was refused over an area of 20,215 hect., or 12·1 per cent. The total percentage of disease among the various crops was as follows: rye 4·6 (as against 0·5 in 1925); wheat 31·8 (37·7); barley 33·4 (15·7); oats 47·3 (22·2); and potatoes 77·1 (78·6). The percentage distribution of individual diseases was as follows: bunt of wheat [*Tilletia tritici* and *T. levis*] 3·1 (compared with 4·1 in 1925); loose smut of wheat [*Ustilago tritici*] 0·9 (1·5); loose and covered smut of barley [*U. nuda* and *U. hordei*] 2·5 (3·3); loose smut of oats [*U. avenae*] 3·9 (1·9); and flag smut of rye [*Urocystis occulta*] 0·05 (0·002).

MCKINNEY (H. H.). **Factors affecting certain properties of a mosaic virus.**—*Journ. Agric. Res.*, xxxv, 1, pp. 1–12, 1927.

The scope of the author's work was to determine whether the properties of such viruses as those of cucumber and tobacco mosaic might be explained on the sole basis of differences between the extracts of the two species of plants. As, however, a series of experiments directed to a similar end had already been begun by M. N. Walker [*R.A.M.*, v, p. 754], the author confined all the inoculations to tobacco virus; the studies on the effects of plant extracts on the virus were carried out *in vitro*.

In all the experiments on thermal inactivation, the extracts were placed in small containers, corked at each end, and completely immersed in an insulated water-bath. The method is stated to have proved very convenient, and to have given greater regularity in heat penetration than did the use of incompletely immersed test-

tubes. The results [which are given in tabular form] showed that the temperatures at which the virus of tobacco mosaic became inactivated depended upon the degree of concentration of the virus, and on the nature of the plant extract. Virus diluted one hundred times with water was inactivated in 10 minutes at a temperature between 82° and 84° C., while the same virus undiluted was inactivated at a temperature between 88° and 90°. Fluid extract from healthy cucumber plants appeared to have a more depressing effect on the potency of the virus than did an equal amount of water or tobacco extract fluid. Virus diluted with water, tobacco, or cucumber juices lost its potency more rapidly than did undiluted virus extract, but such initial reduction in potency did not appear in all cases to be permanent [ibid., vi, p. 193].

McKinney (H. H.). **Quantitative and purification methods in virus studies.**—*Journ. Agric. Res.*, xxxv, 1, pp. 13-38, 3 pl., 2 graphs, 1927.

The author's experiments [which are described in detail, and the results of which are shown in tabular form] indicated that the virus of tobacco mosaic can be studied quantitatively by employing a standard dilution and inoculation technique, which enables the 'virus unit' concentration to be calculated. This unit is defined as the concentration of virus in an extract which, on the average, is just capable of producing mosaic in 100 per cent. of the plants inoculated by the method described. The accuracy of this method was found to depend on several factors which are not easily controlled, but it is stated to offer a basis for the further improvement of quantitative methods. The preparation of virus in some standard form should simplify the present difficulty of growth variables which occur in experiments not conducted simultaneously.

It was found that filtrates of the extract from infected tissues tended to be low in virus concentration and that the filter slime, composed of suspensoidal and colloidal materials contained in the extracts, removed much of the virus. Tests carried out with a high-speed centrifuge (about 50,000 revolutions per minute) showed that the heavy suspended particles in a virus extract can be removed by centrifugal force without seriously reducing the concentration of the virus in the fluid fraction. Much of the virus can then be removed from the fluid by heat coagulation at 65° C. for 10 to 15 minutes, and further centrifugation.

The concentration of the virus appeared to vary in plants grown under different conditions, in plants of different ages, and in different parts of the same plant. The concentration of virus in an extract was found to be influenced by the methods used in preparing the tissue and in making the extraction. The chemical and physical behaviour of the extract was also found to vary in plants of different ages, and in plants of the same age grown under different conditions.

In some tests made to see if tobacco mosaic could be transmitted from the soil, the author obtained positive results both by the addition of juice and pulp from mosaic tobacco plants to virus-free soil and also by merely growing seedlings in soil containing the fresh roots of a previous diseased crop. The treatment of such

mosaic-infective soils with formalin was found to produce effective sterilization.

Vouk (V.). **The problem of symbiosis from physiological point of view.**—*Bull. Trav. Cl. des Sci. Math. et Nat. Acad. des Sciences et des Arts des Slaves du Sud*, Zagreb, xxi. pp. 61–67, 1927.

In the present summary [written in English] of his paper published in the Jugoslavian journal *Rad*, ccxxxii, pp. 108–124, the author briefly reviews the various concepts of symbiosis, and points out the difficulties presented by the definitions of this phenomenon given by different authors. In his opinion and in the light of recent work [which is discussed in some detail] symbiosis is best defined, from a physiological point of view, as 'a cellular co-existence of heterogeneous organisms in a state of physiological balance'. Many years of observation on the nutrition of the symbionts has confirmed him in the view that the significance of symbiosis centres in the correlation of the bionts in regard to nitrogen and carbon assimilation. He distinguishes two types of symbiosis, namely, (1) mycosymbiosis, in which the fungal or bacterial endophyte acts as a nitrogen assimilator, and (2) phycosymbiosis, in which the algal endophyte assimilates carbon.

Craigie (J. H.). **Experiments on sex in rust fungi.**—*Nature*, cxx, 3012, pp. 116–117, 1927.

To ascertain whether heterothallism occurs in rust fungi, the author sowed the sporidia of *Puccinia helianthi* singly on leaves of young sunflower plants. Within two weeks, each isolated pustule derived from a monosporidial infection usually developed pycnidia which excreted nectar, but did not give rise to any aecidia. In a compound pustule formed by coalescence of two monosporidial infections, when the two centres of infection were not more than 1 mm. apart, aecidia appeared 10 or 11 days after the sowing of the spores, or not at all. When two simple pustules derived from monosporidial infection arose, the nearer they were to one another, the sooner they coalesced and produced aecidia. About 50 per cent. of the compound pustules derived from two centres of monosporidial infection not more than 2 mm. apart produced aecidia.

About 60 per cent. of the pustules which in three weeks had not produced aecidia did not do so even if they persisted for six weeks; the remainder produced aecidia normal in form and colour. In at least some of these aecidia the aecidiospores were uninucleate [see next abstract], but those in aecidia produced in a compound pustule were all binucleate.

The author concludes that the pycnospores are not functionless male gametes, but conidia, and correspond to the uninucleate oidia appearing on monosporous mycelia of such heterothallic Hymenomycetes as *Coprinus lagopus*, *C. niveus*, *Stropharia semiglobata*, and *Collybia velutipes*. Pycnospores produced on (+) monosporidial mycelia are (+) in their sexual nature, and conversely. The sporidia are unisexual, and produce unisexual mycelia. Segregation of the (+) and (−) factors is said probably to occur in the promycelium during nuclear division, in the same manner as in the

basidium of *Coprinus rostrupianus* and *C. radians* (*C. domesticus*). When two sporidia of opposite sexes are sown close together on a sunflower leaf, the two monosporous mycelia fuse together, and give rise to normal binucleate aecidiospores, each conjugate pair of nuclei formed in the spore-bed consisting of a (+) and a (−) nucleus, derived, respectively, from a (+) and a (−) mycelium. When two sporidia of the same sex are sown close together, the two monosporous mycelia do not interact sexually. The belated aecidia which appear after about three weeks on pustules of monosporidial or bisporidial origin, where the two sporidia are presumably of the same sex, arise probably without hyphal fusions.

Preliminary experiments made by sowing sporidia of *Puccinia graminis* on barberry leaves have given apparently similar results.

Craigie (J. H.). **Discovery of the function of the pycnidia of the rust fungi.**—*Nature*, cxx, 3030, pp. 765–767, 2 figs., 1927.

The author's further experiments, which are briefly described, enable him to state definitely that *Puccinia graminis* is heterothallic, like *P. helianthi* [see last abstract]. They have also demonstrated that the pycnospores of the rusts are not functionless male gametes, but are (+) or (−) haploid spores, which, by mingling, give rise to the diploid phase, leading to the development of aecidia.

In 184 clusters of pycnidia of *P. helianthi*, each arising from a monosporidial infection. the spore-containing nectar from each was mixed with that from several other pustules, while in 174 similar pustules the nectar was stirred up but not mixed with that from the others. Five days later 176 of the former batch had produced aecidia, 4 had none, and 4 had withered and died; while in the second batch 20 had produced aecidia and 154 bore pycnidia only. Similar results were obtained with *P. graminis* on barberry leaves, 102 out of 116 mixed pustules giving aecidia in six days, while only 17 of 85 unmixed did so. A case is figured of an inoculated barberry leaf, in one half of which the nectar from all the monosporidial clusters of pycnidia was well mixed, while in the other half no intermixing was done; the former, photographed nine days later, shows a large number of aecidial sori, the latter none.

Proof was obtained that flies are responsible for the mixing of the nectar of different pycnidial clusters, a suggestion made to the author by A. H. R. Buller. A number of flies were enclosed in a cage with sunflowers, on the leaves of which were 98 monosporidial pycnidial pustules but no aecidia, while there were 159 similar pustules in another cage without flies. Eight days later 96 of the former and five of the latter bore aecidia.

Heating the nectar to 70° C. before mixing is effective in preventing the development of aecidia, indicating that it is the pycnospores (which are killed if heated to 70°) that are the active agents in the process.

Thus, besides the production of aecidia by the union of (+) and (−) sporidial mycelia as described in the preceding paper, these organs can also be produced by the union of (+) and (−) pycnospores. A third group of aecidia includes those mentioned under

most of the experiments as appearing spontaneously, and the origin of this group is at present unknown.

The earlier statement [see last abstract] that the aecidiospores derived from monosporidial mycelia are at least sometimes uninucleate is stated to have been found incorrect on further study, all the mature aecidiospores being binucleate.

PARK (M.). **Some investigations into conditions affecting the parasitism of Rhizoctonia solani Kühn.**—*Ann. Roy. Bot. Gard., Peradeniya*, x, 3, pp. 259–273, 2 figs., 1 graph, 1927.

Details are given of the author's experiments under controlled conditions to determine the effect of soil moisture and atmospheric humidity on the parasitism of *Rhizoctonia* [*Corticium*] *solani*, a summary of which has already been noticed [*R.A.M.*, vi, p. 312]. In one series delinted Cambodia cotton seed was sown in beakers with inoculated soil containing 15, 20, 25, 30, and 35 per cent. by weight of water, the last being the saturation figure. In another the soil was kept constant at 25 per cent. moisture, but the beakers were covered with bell jars and the air humidity regulated by the use of sulphuric acid. The results indicated that variations in the water content of the soil, provided this was sufficient for the proper growth of the seedlings, had little or no effect on the extent of infection, while the incidence and severity of the disease increased with an increase in the humidity of the air between 41·1 per cent. and saturation.

HIGGINS (B. B.). **Physiology and parasitism of Sclerotium rolfsii.**—*Phytopath.*, xvii, 7, pp. 417–448, 5 figs., 3 graphs, 1927.

This is an amplified account of the writer's investigations on the physiology and parasitism of *Sclerotium rolfsii*, a preliminary note on which has already been published [*R.A.M.*, vi, p. 439]. The evidence that oxalic acid is responsible for the death of the host tissues in plants attacked by this fungus is considered to be conclusive, since plants were killed by the filtrate from cultures on pure sugar solutions where oxalic acid appeared to be the only metabolic product formed in any significant quantity, the toxicity increased directly with the increase in the free acid in the filtrate, the injuries produced were similar to those caused by pure oxalic acid solutions, and considerable quantities of oxalic acid or soluble oxalates were found in the dead host cells before entrance of the hyphae, whereas there was none in the healthy cells of the same plant.

ELZE (D. L.). **De verspreiding van virusziekten van de Aardappel (Solanum tuberosum L.) door insekten.** [The dissemination of virus diseases of the Potato (*Solanum tuberosum* L.) by insects.]—*Inst. voor Phytopath. Lab. voor Mycol. en Aardappelonderzoek Meded.* 32, 90 pp., 2 pl., 6 figs., 1927. [English summary.]

A series of experiments was carried out at Wageningen (Holland) to determine the part played by various insects in the dissemination of virus diseases of the potato. The insects used in the tests [the results of which are tabulated and discussed], included *Myzus*

persicae, *M. pseudosolani*, *Aphis rhamni*, *A. fabae* (*A. rumicis*), *Typhlocyba solani*, *Lygus pratensis*, *Psylliodes affinis*, *Eupteryx auratus*, and *Mamestra brassicae* [*R.A.M.*, iii, p. 161; v, p. 439; vi, p. 311], all of which were found to be capable of transmitting one or more of the following diseases: leaf roll, common mosaic, crinkle, stipple-streak, intervenal mosaic [ibid., vi, p. 311], and spindling sprout. Aucuba mosaic, however, could not be transmitted by this method. *Myzus persicae* showed the highest degree of infective capacity, while with *A. fabae* and insects other than aphids few positive results were obtained.

Leaf roll was readily transmitted by *M. persicae*, *M. pseudosolani*, *A. rhamni*, and possibly *A. fabae*, *E. auratus*, *Lygus* sp., and *P. affinis*. This disease proved the most easily transmissible of all. Mosaic was transmitted by *M. persicae*, *M. pseudosolani*, *A. fabae*, *Mamestra brassicae*, and probably by *P. affinis*. *Myzus persicae*, *M. pseudosolani*, *A. rhamni*, cicadas, and possibly *P. affinis* were successful in the transmission of crinkle. Where the Bravo variety was used as the source of infection, the crinkle symptoms were transmitted by *M. persicae* to Schotsche Muis [Midlothian Early] in the form of stipple-streak, thus confirming Atanasoff's belief [ibid., vi, p. 114] that Bravo is a latent carrier of the latter disease. When infection was transmitted by *A. rhamni* from the Zeeuwsche Blaue variety (highly susceptible to streak) to Midlothian Early and Bravo, the progeny of the former showed the typical streak symptoms, while those of the latter were crinkled. Paul Kruger [President] remained healthy in both tests. It may be concluded from these experiments that stipple-streak and crinkle are transmissible by the same insects. *M. persicae* was also found to be capable of transmitting intervenal mosaic and spindling sprout. No evidence was obtained of any definite association between leaf roll and spindling sprout, as assumed by Schultz and Folsom (*Journ. Agric. Res.*, xxi, 1921); in fact, the absence of any trace of spindling sprout in the progeny of leaf roll plants is considered to disprove this theory.

The results of incubation experiments with *M. persicae*, conducted on similar lines to those of Severin with *Eutettix tenella* [*R.A.M.*, i, p. 229], indicated that the period between the first contact and the development of infectivity in the insect ranges from 24 to 38 hours. Aphids transferred from diseased potato plants to spinach lived for seven to ten days on the latter host, and then infected healthy potatoes. The infective principle does not appear to be directly transmissible from adult aphids to their progeny. Observations on the rate of transmission of the virus denoted that a period of at least four weeks is necessary for infection to pass from the top of the plant to the tubers. The susceptibility of plants of various ages was determined by weekly infections with virus-bearing aphids, the plants thus treated being allowed to grow until the harvest. The young plants infected in the first weeks became diseased, while those infected at later periods remained healthy. All insects increasing in the late summer would appear, therefore, to be of little importance in the transmission of the virus diseases.

Discussing the theoretical significance of his experiments and

those of previous investigators, the author thinks that the manner in which the different virus diseases are adapted to certain insects is a strong proof that the virus is a living organism with definite environmental requirements.

A bibliography of 128 titles is appended.

Jehle (R. A.). **Disastrous effect of mosaic on the McCormick Potato.**—*Maryland Agric. Exper. Stat. Bull.* 282 (*Thirty-ninth Ann. Rept. Maryland Agric. Exper. Stat. 1925–1926*), pp. 215–219, 2 figs., 1926. [Received November, 1927.]

During the last five years the McCormick potato variety has suffered so severely from mosaic in Maryland that it has become necessary either to substitute resistant varieties, e.g., Jersey Redskin, or to procure resistant strains of McCormick from other localities. A promising strain has been obtained from Pennsylvania, only about 4 per cent. of the fields planted with this seed contracting mosaic, compared with 50 to 100 per cent. in home-grown fields. Three distinct types of mosaic are distinguished on this variety, namely, a mild type characterized by slight dwarfing and mottling: a more severe form (probably corresponding to rugose mosaic) [*R.A.M.*, vi, p. 248], in which the plants were very stunted, and showed decided curling and mottling of the foliage, accompanied by suppression of blossoming; and an extremely severe type in which these symptoms were intensified. The last-named form is thought to be the result of a combination of virus diseases.

Stapp (C.). **Die Bakterienringfäule der Kartoffel.** [The bacterial ring rot of the Potato.]—*Biol. Reichsanst. für Land- und Forstwirtsch. Flugbl.* 36 (5th ed.), 4 pp., 4 figs., 1927.

A brief, popular description is given of the external and internal symptoms of bacterial ring rot of potatoes (*Bacterium sepedonicum* Spieckermann et Kotthoff) [*R.A.M.*, vi, p. 147], which was first observed in Germany at the beginning of the twentieth century. The stems of affected plants are short and the leaves abnormally small, sometimes curled and yellowish. These and other macroscopic symptoms, however, are not peculiar to ring rot, which may be recognized by the occurrence of translucent yellow to light brown zones along the vascular bundles, 1 to 2 cm. below the hilum of the tuber. These zones, which generally measure only a few millimetres in width, are of a soft, pulpy consistency. In very severe cases the interior of the tubers may be penetrated, but the internal tissues are seldom completely rotted. Diseased tubers bear no external trace of decay. A short account is given of the causal organism and its activity. Suitable cultural measures for the control of the disease are indicated.

Schlumberger [O.]. **Die Produktion krebsfester, anerkannter Pflanzkartoffeln in Deutschland im Jahre 1926.** [The production of wart-immune, certified seed Potatoes in Germany in the year 1926.]—*Deutsche Landw. Presse*, liv, 30, pp. 405–406, 1927.

In 1926 seed potatoes certified to be immune from wart disease

[*Synchytrium endobioticum*] in Germany covered an area of only 12,520 hect. compared with 19,885 hect. in 1925 [*R.A.M.*, v, p. 513]. The number of wart-immune varieties on the German market is now 59. A marked extension in the area under immune varieties is recorded from Saxony (27·45 per cent. compared with 2·12 per cent. in 1925), as well as from Hanover and Silesia. A strong preference is widely shown for the yellow-fleshed varieties of the Preussen and Johanssen type.

Wart disease: Immunity tests.—*Scottish Journ. of Agric.*, x, 3, pp. 333–337, 1927.

Tests of potato varieties for immunity from wart disease [*Synchytrium endobioticum*] were resumed at the Seed Testing Station of the Board of Agriculture for Scotland during the winter of 1926–7 to test the efficacy of the method previously devised [*R.A.M.*, v, p. 759] when applied on a larger scale. The number of individual tubers tested was 6,036, including 3,531 whose reaction to wart disease was unknown.

The infective material used was composed of rotted wart tissue intimately mixed with sphagnum, infective washings being applied later. Tests were first made with 190 tubers of undisclosed identity; when this was revealed, the test was found to have established the susceptibility of eight seedling varieties which had not become infected under field test in the previous summer.

An attempt was next made to define the minimum number of tubers of any variety necessary for a critical test of immunity. The 380 varieties used were subjected to an eliminating test, each being represented by one tuber. These were exposed to infection, after they had sprouted, by washings from the infective material containing sporangia and active zoospores. Four tubers were then taken of each of the varieties that escaped infection in the eliminating test, and these were similarly treated. All the determinations secured accorded with those previously made at Ormskirk and Philpstoun, with the exception that tubers of Raeburn's Gregor Cups variety, previously regarded as susceptible, remained unaffected even after extensive laboratory tests, while the following varieties, not previously known to be attacked, proved susceptible under laboratory conditions: X6, Mr. Bresse, Seedling 20 (4) S.S.R.P.B., Blue Gray, Mosaic Rogue, Rogue like Conquest, and Tintedflower Rogue.

The investigation is stated to have succeeded in establishing the susceptibility of 905 varieties previously untested. The whole experiment was carried out in an open laboratory, as part of the routine work of the Station, at a capital cost of £40 for metal frames and earthenware receptacles. No additional staff was involved.

Murphy (P. A.). **The production of the resting spores of Phytophthora infestans on Potato tubers.**—*Scient. Proc. Roy. Dublin Soc.*, xviii (N.S.), 29–42, pp. 407–412, 1 pl., 1927.

In this paper the author describes in detail a number of observations and experiments in the production of the resting spores of *Phytophthora infestans* on potato tubers. This is said to be the

first record of the development of perfect sexual organs on the potato plant itself, and of the production of resting spores on tubers under natural conditions in the soil, which the author considers the natural place for their formation.

In 1921 the presence was detected on portions of naturally infected potato tubers, contaminated with other organisms, of oogonia of *P. infestans,* some of which were abortive while others contained parthenogenetic oospores. Further investigation showed that similar bodies were sometimes produced in pure growths of the fungus on the surface of portions of living potato tubers, whether naturally infected or artificially inoculated, and that, very occasionally, a perfect set of organs, consisting of oogonium, amphigynous antheridium, and oospore, was produced. In some cases, it was established that the oogonia sprang from the same mycelium as the conidiophores.

That the sexual organs may occur in nature, and that there also they are found among the mycelium on the surface of the potato tuber, was shown by the following experiment. A half tuber, artificially inoculated with a pure culture of *P. infestans,* was planted near the surface of a pot of sterilized soil. Three weeks later, it exhibited a strong growth of the blight fungus. This was breaking out in pustules at the lenticels on the uninjured skin, and was spreading in the soil; abundant conidia were present, but there were no sexual organs. When the seed-piece was lifted out of its bed, a faint, greyish mycelium was found on the floor of the latter; on examination, it was seen to consist almost entirely of *P. infestans,* together with a little *Rhizoctonia.* The conidiophores and conidia of the former were present, and almost every fraction of the non-septate mycelium was forming oogonia, full of protoplasm and apparently normal, except that no antheridia were present.

MURPHY (P. A.) & McKAY (R.). **Some further cases of the production of diseased shoots by Potato tubers attacked by Phytophthora infestans, and a demonstration of alternative sources of foliage and tuber infection.**—*Scient. Proc. Roy. Dublin Soc.,* xviii (N.S.), 29–42, pp. 413–422, 1 pl., 1927.

The authors describe in detail two cases in which diseased shoots, produced by blighted potato tubers planted in the open, reached the surface of the ground and bore conidia which led to aerial infection of neighbouring shoots; this successful result is attributed to the fact that the potatoes were planted late when the soil was warm, and were not deeply covered. Laboratory experiments conducted at a temperature of about 25° C. similarly established the production of infected sprouts from diseased tubers, the progress of the invasion from the tuber being watched step by step.

The growth of the fungus from diseased tubers or sprouts into the surrounding soil was demonstrated; infected sprouts which failed to reach the surface gave rise in some cases to a considerable development of mycelium and conidia for a distance of one or two centimetres in the soil. Conidia thus produced were found viable up to 57 days after planting, when cut inoculated tubers were used. Temperatures which are apparently too low to allow the fungus on infected sprouts to reach the surface permit this type of develop-

ment to take place. These results are believed by the authors to represent what usually happens in the field. How the infective material reaches the surface from deeply planted tubers has not yet definitely been ascertained, but the emergence from blighted tubers of flies of the genus *Sciara* carrying conidia of *P. infestans* was observed under laboratory conditions. Tillage operations may also bring the buried conidia to the surface.

An experiment conducted in the open with the purpose of securing aerial infection with blight from the planting of diseased tubers revealed the fact that the new tubers could be invaded although no disease existed on the foliage. The invasion appeared to occur by the spread of infection through the stolon to the new tuber.

The authors discuss the relative importance of (1) the emergence of diseased shoots, (2) the production of infecting material in the soil near blighted tubers, and (3) the possible hibernation of the fungus in the soil in the open, in causing primary foliage infection. While the frequency with which each of these sources of infection occurs in nature is still obscure, it is clear that the possible importance of the second is considerable.

BOYD (O. C.). **A stem and tuber rot of Potato in Georgia.**—*Plant Disease Reporter*, xi, 6, p. 75, 1927.

A few tubers of Irish Cobbler potatoes dug during very dry weather in May, 1927, showed spots resembling those caused by late blight [*Phytophthora infestans*] in its early stages. This similarity increased during the following week, except that the spots on the Georgia tubers were darker and less moist than those of late blight. Most of the infection centres were at the lenticels. A few tubers were affected at the stem end, indicating the progression of the disease through the stolon into the tuber. About 50 per cent. of all the tubers dug on 13th June, shortly after the beginning of the rains, were infected by the rot, which occurred also on the Green Mountain and Spaulding Rose varieties. About half the affected tubers developed soft rot, while the remainder, though badly spotted, retained their firmness.

About 50 per cent. of all the plants also showed a recently developed stem and root rot, which sometimes involved the base of two or three branches. Older specimens of this type showed numerous pycnidia with *Macrophoma*-like spores. The root and stem lesions closely resembled those produced by *Macrophoma* on beans [*Macrophomina phaseoli*: *R.A.M.*, vi, pp. 138, 757], especially in the later stages of the disease. The pith of the stem was filled with the characteristic black, sclerotial bodies, and the dry cortex sloughed off, leaving a dry, ashen-grey xylem. A fungus resembling in pure culture the *Macrophoma* common on snap beans [*Phaseolus vulgaris*] in Georgia, and unusually prevalent in 1927, was isolated from the stems, roots, and tubers of affected plants: sclerotial bodies were developed in profusion in the cultures, but no pycnidia.

HEMMI (T.). **An outline of the experimental study on the 'indefinite' diseases of the Rice plant.**—*Ann. Phytopath. Soc. Japan*, ii, 1, pp. 9–13, 1 fig., 1927.

For about a year and a half the writer has been investigating the

hitherto neglected problem of the pathogenicity of the fungi inhabiting rice seed-beds. Cultures were secured from the seeds, roots, culms, and leaves of rice plants and other cereals and also from germinating rice seeds. Four different methods of inoculation were used: the first was substantially identical with that of L. J. Stakman [*R.A.M.*, iii, p. 82]; in the second, the disease-free seedlings were grown on sterilized soil in L-shaped tubes, where the roots became gradually infested by the fungus previously grown on chaff in the bottom of the tubes; while in the third and fourth the fungi were tested by inoculating the soil in pots or the sand in dishes with pure cultures and planting each with sterilized seeds.

It was found that certain organisms isolated from the leaf and culm, e. g., *Piricularia oryzae, Helminthosporium oryzae, Hypochnus* [*Corticium*] *sasakii*, and *Sclerotium oryzae-sativae*, can infect the roots of rice seedlings. This is believed to be the first record of the pathogenicity of *P. oryzae* and *H. sasakii* on the roots [ibid., vi, p. 641]. Several strains of fungi, apparently species of *Brachysporium*, were isolated from the surface of rice seeds and found to be serious parasites of the base and root. *Gibberella saubinetii* and other species of *Fusarium*, all very common on rice plants in Japan, were also shown to be highly destructive to the root system.

From these preliminary data it may safely be concluded that rice seedlings are liable to attack by many fungi in the seed-bed, and that such root-rotting organisms greatly contribute to the reduction of yield on land used more or less constantly for this crop.

HEMMI (T.) & MATSUURA (I.). **On the mutation of a Hyphomycetous fungus parasitic on the Rice plant.**—*Ann. Phytopath. Soc. Japan*, ii, 1, pp. 26–52, 1 pl., 1927. [Japanese, with English summary.]

In this paper the writers record the occurrence of a distinct albino mutation, in apricot decoction agar cultures, of a *Brachysporium* isolated from an infected rice seedling in April, 1925 [cf. *R.A.M.*, ii, p. 76]. In the following October a sector of the mycelium was found to be white, in contrast to the usual dark brown colour. When transferred to other media this sector produced conidia corresponding substantially in size and shape with those of the normal strain. Cultures from monospore isolations and from fragments of mycelium all remain constant for the character of albinism. Both the mutant and its parent show approximately equal degrees of virulence when inoculated on rice seedlings, and both grow best at about 28° C.

ITO (S.) & KURIBAYASHI (K.). **Production of the ascigerous stage in culture of Helminthosporium oryzae.**—*Ann. Phytopath. Soc. Japan*, ii, 1, pp. 1–8, 3 pl., 1927. [Japanese summary.]

Small blackish sclerotial bodies are sometimes found in cultures of *Helminthosporium oryzae*, the causal organism of leaf spot of rice [*R.A.M.*, ii, p. 230], but the occurrence of mature perithecia of this fungus has not yet been recorded. In the autumn of 1925, however, *H. oryzae* was frequently isolated from 'rusted' rice seeds

(i. e., those having a brownish or spotted surface), chiefly of the Bozu variety, and mature perithecia developed in cultures from the grains, pericarps, and seeds (but not from leaves except sparingly and then in an imperfect condition) on rice-culm decoction agar at 25° C. These organs, which attain their full size in 15 to 20 days, are globose or depressed globose, with a dark yellowish-brown, pseudoparenchymatous outer wall and a hyaline pseudoparenchymatous interior, and measure on an average 560 to 950 by 368 to 777 μ. The numerous cylindrical or long fusiform asci, measuring 142 to 235 by 21 to 36 μ, contain one to eight (usually four or six) filamentous or long cylindrical, hyaline or pale olive-green ascospores which are coiled in a close helix, have 6 to 15 (mostly 9 to 12) septa, and measure 250 to 468 by 6 to 9 μ. The liberated ascospores begin to germinate in about 30 minutes by 10 to 15 germ-tubes on rice decoction agar, and the mycelial mass attains 25 mm. in diameter in four days. Typical conidia of *H. oryzae* were produced in ten days.

The fungus under discussion is somewhat related to *Ophiobolus oryzae* Miyake and in many respects also to *O. heterostrophus* [ibid., vi, p. 547], but differs from these species in its larger dimensions. Cross-inoculations with conidia of the last-named fungus from maize on rice and with *H. oryzae* from rice on maize gave only incipient infections, whereas each proved to be a vigorous parasite on its proper host. It therefore seems reasonable to regard the Japanese fungus as an independent species, to which the name of *O. miyabeanus* n. sp. (with a diagnosis in English) is given.

NISIKADO (Y.). **Comparative studies on Helminthosporium diseases of Rice in the Pacific regions.**—*Ann. Phytopath. Soc. Japan*, ii, 1, pp. 14–25, 1 pl., 1927. [Japanese summary.]

In this paper the author presents the results of his comparative studies on Japanese and American strains of *Helminthosporium oryzae*, the causal organism of leaf spot of rice in the Pacific regions [see last abstract].

The lesions produced on plants inoculated with the strains from both countries were almost identical in shape, size, and colour. The small, brown, circular, or oval spots measured 1·5 to 2 by 0·5 to 1 mm. In advanced stages of infection by the Japanese strain, the glumes seemed to be covered with dark brown hairs.

The hyphae of the American strain were more slender than the Japanese (2·5 to 6·5 μ wide compared with 5 to 7·5 μ), and marked divergences were observed in the spores of both strains on Hopkins's agar medium at 22° and 27° C. Those of the Japanese strain were obclavate, broadest at a point one-third from the base, tapering towards both ends, and provided with a prominent hilum. The spores of the American strain, which were of a dark olive-buff colour, were fusoid to cylindrical, broadest in the middle, regularly curved to one side, and having a very small, sunken hilum. The average dimensions of the Japanese strain at 22° were $93{\cdot}94 \pm 0{\cdot}8$ by $17{\cdot}35 \pm 0{\cdot}06$ μ, while those of the American were $103{\cdot}90 \pm 0{\cdot}48$ by $15{\cdot}69 \pm 0{\cdot}04$ μ. The average number of septa was seven in both strains.

Considerable physiological differences between the two strains

were also observed, the Japanese growing best in solutions containing maltose, while the American strain preferred levulose. At 21° to 22° and 26° to 27° the Japanese strain made more profuse growth than the American, while at 32° to 33° the position was reversed.

Both strains were inoculated on the seedlings of some 480 varieties of cultivated rice from Japan, Korea, Formosa, China, Hawaii, and Java. The results of these experiments showed little difference between the strains as regards pathogenicity.

It is concluded that the discrepancies between the Japanese and American strains of *H. oryzae* are sufficient to justify their differentiation as two distinct morphological forms or possibly separate species.

SPOON (W.). **Invloed van uspulun op de innerlijke eigenschappen van de Rubber.** [Effect of uspulun on the internal properties of Rubber.]—*Arch. voor Rubbercult. Nederl.-Indië*, xi, 2, pp. 74–78, 1927. [English summary.]

An account is given of some experiments conducted at the West Java Rubber Experiment Station to determine the effect of uspulun (which is stated to have been proposed for use as a disinfectant of the tapped surface of rubber trees) on the internal properties of rubber. Uspulun is stated to consist of 20 per cent. mono-chlormercuro-phenolate ($Cl-C_6H_4-OHg$), the remaining 80 per cent. of the powder being composed of different substances calculated to ensure durability and resistance to moisture. A blue colouring matter is added to distinguish treated seeds and other material. The coagulation of latex to which 0·1 per cent. uspulun was added at the rate of 100 c.c. per l. was slightly retarded, and the coagulum showed a greyish tinge which persisted in the dry crepe. There was little difference as regards viscosity and other internal properties between treated and untreated samples of latex.

STOUGHTON (R. H.). [Formerly Stoughton-Harris.] **The efficiency of disinfectants and fungicides.**—*Rubber Res. Scheme (Ceylon) Bull.* 45, 12 pp., 1 diag., 1927.

This report describes in detail the author's experiments to determine the efficiency of a number of disinfectants in inhibiting the development of *Phytophthora faberi* [*R.A.M.*, vi, p. 577] grown in pure culture.

The effective inhibiting percentage concentration for the preparations tested was as follows: brunolinum plantarium, 0·125; brunolinum hybol, between 0·05 and 0·1; brunolinum cresoleum, between 0·05 and 0·1; carbolineum heveaum, between 0·25 and 0·5; agrisol, between 0·25 and 0·5; izal, between 0·05 and 0·1; arboretas, between 0·05 and 0·1; cargillineum (emulsified with 1 per cent. soap), between 0·5 and 1·0.

The presence of tar acids (cresols and the like) very considerably increased the toxicity of a tar product known as 'creosote soluble'. When 0·1 per cent. tar acids were added the concentration of the mixture necessary to inhibit growth was reduced from 0·6 per cent. to 0·25 per cent. A content of about 10 per cent. of tar acids appears most desirable in a disinfectant. A 50 per cent. emulsion

of mono-chlor-naphthalene was found to have an effective inhibiting concentration of between 0·2 and 0·4 per cent.

Paranitrophenol [ibid., v, p. 694] and dinitrophenol, suggested as preventives of mould on smoked sheet, were tested on a species of *Oospora*, and also on *P. faberi*. Much higher concentrations of the two chemicals were found necessary to prevent the growth of *Oospora* than of *P. faberi*. In the case of paranitrophenol, the effective inhibiting concentration against *P. faberi* was about 0·006 per cent., and for the mould was between 0·01 and 0·015 per cent. With dinitrophenol a concentration of 0·005 per cent. proved sufficient against *P. faberi*, but one of 0·0175 permitted considerable growth of the *Oospora*.

This differential toxicity is stated to be of much importance, in that it shows that the use of the same fungus in all tests, without consideration of the particular purpose for which the disinfectant is to be used, may lead to wholly erroneous conclusions.

STOUGHTON (R. H.). **The control of bark rot by disinfectants.**—*Rubber Res. Scheme (Ceylon) Bull.* 46, 8 pp., 1927.

From a further series of experiments [see preceding abstract] carried out in the field, the author concludes that, while there is not a great difference between the various preparations tested, the most efficient on the whole against the bark rot of *Hevea* rubber trees caused by *Phytophthora faberi* are those which mix well with coking-still residue and poorly or not at all with water, such as cargillineum mixture. The use of a mixture of this kind about every fourth tapping is recommended.

GARRETSEN (A. J.). **Verslag over een bezoek aan Britisch-Indië in verband met het Helopeltis-vraagstuk.** [Report on a visit to British India in connexion with the *Helopeltis* problem.]—*Arch. voor Theecult. Nederl.-Indië* [formerly *De Thee*], i, pp. 7–63, 8 pl., 10 diags., 2 maps, 1927. [English summary.]

During the writer's tour of the tea districts of north-eastern India in 1924, he made some observations on fungous diseases in addition to the main investigations of the *Helopeltis* problem. Red rust (*Cephaleuros virescens*) [*C. mycoidea* and *C. parasiticus*: *R.A.M.*, iii, p. 4] was found to be far less frequent as a sequel to *Helopeltis* and other insect pests than it is in Java. Blister blight (*Exobasidium vexans*), which is not known to occur in the Dutch East Indies, was found to be most prevalent at Darjeeling on the Assam and hybrid varieties; it was not observed on China teas.

WAKSMAN (S. A.). **Cellulose and its decomposition in the soil by micro-organisms.**—*Proc. Internat. Soc. Soil Sci.*, ii, pp. 293–304, 1926. [Received December, 1927].

This paper has already been noticed from another source [*R.A.M.*, vi, p. 373].

GILMAN (J. C.) & ABBOTT (E. V.). **A summary of the soil fungi.**—*Iowa State Coll. Journ. of Science*, i, 3, pp. 225–343, 83 figs., 1927.

This survey of the soil fungi, chiefly of Iowa and Louisiana,

includes twenty new species, cultures of which have been deposited with the American Type Culture Collection at Chicago [*R.A.M.*, vi, p. 742]. The 61 genera and some of the 242 species mentioned are figured, while all are described and bibliographical references are given under each.

WOOD (E. J. F.). **Bureau of Sugar Experiment Stations. Assistant Pathologist's Report.**—*Queensland Agric. Journ.*, xxvii, 6, pp. 498–499, 1927.

In the Bundaberg district of Queensland, mosaic and gumming disease [*Bacterium vascularum*] of the sugar-cane are stated to be widespread. In some localities the incidence of the gumming disease on the very susceptible Badila and N.G. 16 varieties attains from 70 to 100 per cent., while adjacent stands of Q. 813 remain practically immune.

Mosaic was present on all the farms visited, but usually only to a small extent, as in most areas rigorous seed selection and eradication appear to be effective. A case of extensive secondary infection was observed on a farm, on which selected seed from a slightly infected block of M. 1900 Seedling was planted on a newly cleared hillside facing an infected block of D. 1135 on the other side of the valley; at the time of inspection at least 20 per cent. of the new plantation was showing symptoms of secondary infection, usually in the very early stages of growth, and the infection was still progressing. A significant feature was the great prevalence, in the absence of aphids, of the sugar-cane leafhopper (*Perkinsiella saccharicida*), and as the infection was readily transmitted across the valley, while it did not spread over the ridge of the hill, it is inferred that the insects are wind-borne rather than that they move of their own volition, and that they find it difficult to descend a slope facing to leeward.

Leaf stripe [*Sclerospora sacchari*] is still very prevalent at Bingera. Root diseases are also prevalent in the form of peg leg or foot rot [*R.A.M.*, v, p. 632] and of the leaf sheath fungus [ibid., iv, p. 705]. *Marasmius sacchari* was observed in some localities fructifying on diseased sugar-canes, but it is considered to be a secondary agent in the death of the canes, the primary cause being the infertility of the soil.

WOOD (E. J. F.). **Bureau of Sugar Experiment Stations. Assistant Pathologist's Report.**—*Queensland Agric. Journ.*, xxviii, 1, pp. 5–6, 1927.

The Mackay district of Queensland is stated to be the least affected with sugar-cane diseases of all those that have been visited in 1927. The only two diseases of any importance there are mosaic and leaf stripe [*Sclerospora sacchari*], while the gumming disease [*Bacterium vascularum*] was only seen in a small area. Although mosaic is rather widely distributed, it is comparatively slight in all localities, with the exception of the Farleigh and Mount Jukes areas. The attention of the farmers is, however, called to the prevalence in the district of root diseases [see preceding abstract], and recommendations are made for their control.

EDGERTON (C. W.) & CHRISTOPHER (W. N.). **The red stripe disease of Sugar Cane.**—*Planter and Sugar Manufacturer*, lxxix, 4, p. 63, 1927.

A disease of sugar-cane resembling that known in the Hawaiian Islands as red stripe disease [*Phytomonas rubrilineans*: *R.A.M.*, v, p. 133] was frequently observed during 1927 throughout Louisiana. Parallel red stripes appear on the leaves, most abundantly at the base, ranging in length from 2 in. to 2 ft. The bacterium responsible has been isolated, and the disease produced by artificial inoculation.

The condition, which was first observed near Geismar on Cayanna cane, was most prevalent on the D–74 variety. At the experiment station farm at Baton Rouge on 12th July, 1927, from 10 to 30 per cent. of the shoots of this variety showed infected leaves. Louisiana Purple and P.O.J. 234, 213, 36, and 228 showed a trace (up to 1 or 2 per cent.) of infection. The disease was detected on P.O.J. 979, and in the case of the larger P.O.J. canes and the C.P. seedlings, from 0 to 13 per cent. of the shoots showed infected leaves. Thus there is a marked difference in varietal susceptibility.

The authors consider that, in most cases, the disease will probably prove of minor importance.

MAIRE (R.). **Champignons Nord-Africains nouveaux ou peu connus.** [New or little-known fungi in North Africa.]—*Bull. Soc. Hist. Nat. Afrique du Nord*, xviii, 5, pp. 117–120, 1927.

The author points out that the generic name *Keithia* created by Saccardo in 1892 for *Phacidium tetrasporum* Phill. and Keith is invalid, as this name was applied by Bentham in 1834 to a genus of Labiatae. He therefore suggests that *P. tetrasporum* Phill. and Keith should be transferred to the genus *Didymascella* established by Saccardo and Maire in 1903 for a fungus subsequently found to be identical with *P. tetrasporum*, and proposes the name *D. tetraspora* Maire n. comb. This fungus is occasionally found on needles of *Juniperus oxycedrus* in Algeria.

Other species of the genus *Keithia* are renamed as follows: *D. chamaecyparissi* (Adams) Maire n. comb. for *K. chamaecyparissi* Adams (on *Chamaecyparis thyoides*); *D. thujina* (Durand) Maire n. comb. for *K. thujina* Durand (on *Thuja occidentalis*); *D. tsugae* (Farlow) Maire n. comb. for *K. tsugae* Farlow (on *Tsuga canadensis*).

LEONIAN (L. H.). **The effect of different hosts upon the sporangia of some Phytophthoras.**—*Phytopath.*, xvii, 7, pp. 483–490, 6 figs., 1927.

Phytophthora phaseoli, *P. capsici*, *P. omnivora*, and *P. mexicana* were grown on living green bananas, oranges, lemons, potatoes, tomatoes, peppers [*Capsicum annuum*], and eggplants, 85 different cultures being used. About 90 per cent. of the cultures were able to infect all these fruits through wounds and to produce a rapid deterioration of the tissues, the symptoms in the majority of cases being uniform. Many of the strains produced abundant sporangia only on tomatoes, eggplants, and peppers. Remarkable modifications were observed in the morphology of these bodies as a result of the influence of the different hosts. The bearing of these data

on the identification of species of *Phytophthora* is discussed at some length, and the conclusion is reached that identification directly from the host is misleading, controlled cultural work in the laboratory affording a more reliable method. Even in the latter case, however, the variations are so great that the morphological data can rarely permit of the primary separation of the species [cf. *R.A.M.*, vi, pp. 189, 509].

LESTER-SMITH (W. C.). **Some observations on the oospores of Phytophthora species.**—*Ann. Roy. Bot. Gard. Peradeniya*, x, 3, pp. 243–257, 2 pl., 1927.

After briefly reviewing the work of former investigators [*R.A.M.*, ii, p. 183; iv, pp. 65, 414; v, p. 4], the author gives some details of his own experiments made for the purpose of controlling and extending previous observations on the production of oospores in mixed cultures of strains of *Phytophthora faberi* (which, in his opinion, should be known, on grounds of priority, as *P. palmivora*) and of *P. parasitica*. The strains used by him, both in pure cultures and in various combinations with each other, were *P. faberi*: two isolations from rotted cacao pods in Trinidad, two isolations from coco-nut bud rot in Jamaica, and a strain isolated from boll rot of cotton in St. Vincent (all isolated by Ashby); *P. parasitica*: a culture supplied by Sherbakoff (labelled *P. terrestris*), isolated from tomato fruit affected by the 'buckeye' disease in Florida, a strain isolated by Ashby from the vascular system of a banana plant affected by the Panama disease in Trinidad, and a strain isolated by Miss Wakefield from boll rot of cotton in Montserrat. The cultures were made on slants of Lima bean, maize meal, and Quaker oats agars; in every case of mixed cultures, the *P. faberi* strain was inoculated in the centre of the lower half, and the *P. parasitica* strain in the centre of the upper half of the slants.

The result of pure cultures of *P. parasitica* strains gave a mean size for the oospores of approximately 18 μ, with a range of from 13 to 22·9 μ. Mixed cultures of the *P. faberi* strains alone produced definitely amphigynous oospores, the mean size of which was approximately 22 μ with a range of from 16 to 33·8 μ; the author considers these results as equivalent to those, could they be obtained, of pure cultures of the individual strains, none of which, however, yielded these organs except when intermingled. In mixtures of strains of both species, there was evidence of an increase in the mean size of the oospores with the age of the cultures; this fact is interpreted as indicating that oospores of the *P. faberi* strain continue to develop after those of the *P. parasitica* strain have ceased to be produced, the more so since it was never noticed in pure cultures of the latter strains, though slightly noticeable in the mixed cultures of the *P. faberi* strains alone. The results showed conclusively that all three *P. faberi* strains produced oospores abundantly when grown independently with *P. parasitica* strains. The author also believes that they furnished an almost definite proof that these three strains belong to one species, the measurements agreeing with those obtained by Ashby and Gadd. He does not consider that there was any definite morphological evidence of hybridization.

The findings of the present investigation do not support the view that *P. faberi* is heterothallic [ibid., vi, p. 609], since oospores were produced in the mixtures of this fungus with known homothallic strains of *P. parasitica*. While leaving open the question of what the factors are that induce in mixed cultures the formation of oospores by *P. faberi* strains which do not produce them in pure cultures, the view is put forward that it is due to the influence of one vegetation on the other, acting through its effect on the medium. It is held that a normal strain of *P. faberi* is capable of both asexual and sexual reproduction; and that the former is induced by a high rate of metabolism characterized by a high water content and a certain ratio of food material, and the latter is induced by a low rate of metabolism characterized by a low water content, a different ratio of food materials, and possibly a low temperature.

Cultures of *P. nicotianae* from Florida resembled the asexual stage of *P. parasitica* and produced regularly amphigynous oospores when grown in mixed culture with strains of the other two species. These oospores agreed in size and characters with those of *P. faberi*, of which *P. nicotianae* may be only a strain.

In an appendix to this paper the author gives a brief description of stromatoid bodies which he found in several mixed cultures, and which agree with those described and figured by Gadd.

ARTHUR (J. C.). (**Uredinales**) **Additions and corrections (continued).**—*North American Flora*, vii, 11, pp. 733–796, 1926; 12, pp. 797–848, New York Botanical Garden, 1927.

These parts conclude the section of the North American Flora dealing with the rust fungi [*R.A.M.*, v, p. 194].

MANEVAL (W. E.). **Further germination tests with teliospores of rusts.**—*Phytopath.*, xvii, 7, pp. 491–498, 1927.

Continuing his previous investigations on the germination of rust teleutospores [*R.A.M.*, ii, p. 179], the writer recently conducted experiments with the following ten species, all collected at or near Columbia, Missouri: *Melampsora medusae, Uromyces appendiculatus, U. aristidae, U. caryophyllinus, U. hedysari-paniculati, U. howei, U. lespedezae-procumbentis, U. spermacoces, Puccinia emiliae,* and *P. xanthii*. The teleutospores of the two last-named species require no resting period before germination. All the species except *P. emiliae, P. xanthii,* and *U. howei* are eu-types. *M. medusae, U. aristidae,* and *U. caryophyllinus* are heteroecious, and the others autoecious.

When kept alternately wet and dry, or floated continuously on distilled water at room temperature in alternate light and darkness, the teleutospores of *U. aristidae, U. hedysari-paniculati, U. howei,* and *U. lespedezae-procumbentis* germinated in two to six weeks, those of *U. spermacoces* in two to four days, *M. medusae* in two weeks, *U. appendiculatus* in one to four weeks, and *U. caryophyllinus* in six to fifteen days. The teleutospores of *U. spermacoces* and *U. caryophyllinus* germinated better in a solution of 0·5 per cent. potassium dihydrogen phosphate than in distilled water. Similar results have repeatedly been obtained with *P. helianthi*,

the teleutospores of which could also germinate normally in the following relatively highly concentrated solutions: 0·1 per cent. NH_4NO_3, 0·25 per cent. KNO_3, 0·125 per cent. NaCl, 1 per cent. $Ca(NO_3)_2$, 1 per cent. maltose and sucrose, and 2 per cent. dextrose, though these chemicals had little or no favourable effect on germination.

The teleutospores of *P. helianthi*, *P. emiliae*, and *P. xanthii* germinated more readily, and produced many more sporidia in alternate light and darkness than in continuous darkness. The teleutospores of *U. carophyllinus* germinated very readily when the cultures were kept in alternate light and darkness for two to several days, and then placed in continuous darkness. Under certain conditions the teleutospores of *P. emiliae* and *P. xanthii* may continue to germinate after eight to ten months' storage.

SMALL (W.). **Further notes on Rhizoctonia bataticola (Taub.).**—*Trop. Agriculturist*, lxix, 1, pp. 9–12, 1927.

The present notes mention several new hosts of *Rhizoctonia bataticola* recorded since the publication of the last list [*R.A.M.*, vi, p. 439], amongst which are *Cupressus lawsoniana*, *Dahlia*, mangosteen (*Garcinia mangostana*), *Artocarpus integrifolia*, and coconut [see above, p. 29]. French beans (*Phaseolus vulgaris*) in central Ceylon were found to be attacked by a stem blight associated with *Macrophoma phaseoli* [*Macrophomina phaseoli*; ibid., vi, p. 757], and identical with the disease known as ashy stem blight in the United States [ibid., vi, p. 138]. The genetic relationship between this fungus and *R. bataticola* was proved in the laboratory by growing single spores of the bean *Macrophomina* in culture media, the spore in each case giving rise to characteristic growths of *R. bataticola*. A root disease of the bean caused by the latter also occurs in Ceylon, frequently independently of the stem blight. Diseased specimens of *Sesamum indicum* received by the author from Burma bore numerous typical sclerotia of *R. bataticola* on their roots and stems, and also pycnidia strongly resembling those of *M. phaseoli*. *Sphaerostilbe repens* was found lately on tea roots in Ceylon, in association with *R. bataticola*; the latter is also always present with the former when this occurs on diseased roots of *Hevea brasiliensis*, and the author considers *R. bataticola* as the primary cause of both these root diseases, *S. repens* being of only secondary account. The frequent presence of *R. bataticola* and of an eelworm (*Heterodera radicicola*) in numerous further cases of bunchy top of plantains [ibid., vi, p. 439] examined is considered to be a strong evidence in favour of the view that the Ceylon bunchy top disease of plantains is more likely to be due primarily to root disease than to any other cause.

ARNAUDI (C.). **Sui Penicilli del Gorgonzola.** [On the species of *Penicillium* in Gorgonzola cheese.]—*Boll. Ist. Sieroterapico Milanese*, 1, 16 pp., 2 pl., 1927. [Abs. in *Bull. Inst. Pasteur*, xxv, 13, pp. 592–593, 1927.]

The use of pure cultures of *Penicillium roqueforti* having proved very advantageous in the manufacture of Roquefort cheese [*R.A.M.*, iv, p. 109], the author investigated the possibilities of applying

similar methods to Gorgonzola. Fifteen strains of the fungus isolated from samples of the cheese were studied, each being cultivated on twenty-eight different media. One of the strains (15) differed from any of those hitherto described, and has accordingly been named *P. biourgei* n. sp. The remaining strains resembled *P. weidmanni* except in the production of a brown instead of a pink coloration; they are therefore referred to a new variety as *P. weidmanni* var. *fuscum*.

STEINMANN (A.). **Over het optreden van de grijze Dadapschimmel en andere op Thee voorkomende Septobasidium-soorten.** [On the occurrence of the grey Dadap fungus and other species of *Septobasidium* present on Tea.]—*De Thee*, vii, 4, pp. 156–158, 2 pl., 1926. [Received November, 1927.]

Three species of *Septobasidium* are liable to develop on tea bushes in Java, namely, the grey dadap fungus (*S. bogoriense*), *S. cinchonae*, and *S. rubiginosum* [*R.A.M.*, vi, p. 1]. The dry season of 1925 was particularly favourable to the increase of the coccids parasitized by these fungi, hence the abnormal prevalence of the latter in the following year. The remains of the coccids are always to be found enclosed in the basal layer of mycelium.

The bluish- to ashen-grey (later dirty grey to yellow) crust of the dadap fungus is well known on tea, *Leucaena*, *Albizzia*, *Crotalaria*, and other plants. *S. cinchonae* forms a white to whitish-yellow (afterwards brownish-yellow) crust, which in advanced stages bears a certain resemblance to that of *S. bogoriense*. *S. rubiginosum* forms on young rubber, tea, and *Tephrosia* a distinctive chocolate-coloured crust which turns dark brown to purple under humid conditions, and encircles the entire stem immediately above soil level.

S. bogoriense damages the tea bushes chiefly by affording ingress to secondary parasites, such as red rust [*Cephaleuros parasiticus*] and pink disease [*Corticium salmonicolor*]. Direct infection of the branches by the grey dadap fungus has not been observed. *S. cinchonae* behaves similarly to *S. bogoriense*, but *S. rubiginosum*, which is of rare occurrence in Java, has been known to kill $2\frac{1}{2}$-year-old tea and *Tephrosia* bushes.

The control of *S. bogoriense* has hitherto been effected by the application of a solution of 3 kg. soda and 1 kg. unslaked lime in 45 kg. water, or of Bordeaux mixture, to the branches immediately after pruning, followed by vigorous brushing to remove the crust of the fungus and the coccids simultaneously. In order to prevent the development of the fungus attempts should be made to combat the coccids during the dry season, and to reduce the amount of shade round the bushes, admitting plenty of light and air. Brief directions are given for the application of these and other cultural measures.

STEINMANN (A.). **Het determineeren der wortelschimmels van de Thee.** [The identification of the root fungi of Tea.]—*De Thee*, vii, 4, pp. 158–164, 1926. [Received November, 1927.]

This key to the fungi occurring on the roots of tea in Java is intended to assist planters in the work of identification. A useful

table shows at a glance the name of the fungus, its mode of dissemination, and the preventive and curative measures for its control.

STEINMANN (A.). **Een bijzonder geval van Ustulina maxima.** [An unusual case of *Ustulina maxima*.]—*De Thee*, vii, 4, p. 169, 1926. [Received November, 1927.]

As a rule, the stromata of *Ustulina maxima* [*U. zonata*] occur as hard, dry, greyish-black crusts closely appressed to the stem, but under certain conditions they may develop in the form of stalks, crowned by flat, white heads which measure 1 to 2 mm. in height by 2 to 3 mm. in breadth. A striking case of the latter type of growth was recently observed on a tea stem, this being apparently the first record of the kind in Java. Conidia developed on the heads surmounting the stalks, and later perithecia were found within the stromata. These abnormal fructifications of *U. zonata* measured 2 to 4 mm. in height.

Spain. Legislative and administrative measures.—*Internat. Bull. Plant. Protect.*, i, 6, p. 96, 1927.

By Royal Decree No. 832, of 29th April, 1927, live plants, or parts of plants, seedlings, branches, vine shoots, roots, tubers, bulbs, rhizomes, leaves, seeds, and fruits, with or without peel, as well as saffron [*Crocus sativus*] and powdered capsicum, intended for export from Spain, must be of good quality, and certified free from diseases and pests.

To this end, committees of inspection are to be formed in the forwarding ports and frontier stations, and will issue the requisite certificates; they have the right to reject unsuitable goods, in which case no indemnity may be claimed. Inspection dues and those incurred in obtaining the certificate are to be charged to the exporter, who may appeal to the National Phytopathological Service, to whom he must send a sample of the infected goods taken by the inspection committee in his presence. The decision of the Service will be telegraphed, and is final.

Proclamation No. 12 of 1927. [Union of South Africa.]

For the purpose of combating the outbreak of mosaic disease of sugar-cane in the Province of Natal and Zululand, the Governor-General of the Union of South Africa, by this proclamation, dated 4th January, 1927, and issued under the Agricultural Pests Act 1911, prohibited the movement, in these areas, of sugar-cane plants, other than healthy plants of the Uba variety. After 30th June, 1927, no other variety than Uba can be grown in the areas mentioned without the written permission of the Ministry of Agriculture, and the destruction of plants of any other variety may be ordered to be carried out within 14 days by the same authority [cf. *R.A.M.*, vi, p. 696].

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

APPLIED MYCOLOGY

Vol. VII FEBRUARY 1928

Steinmann (A.). **De zwarte wortelschimmels van de Thee.** [The black root fungi of Tea.]—*Arch. voor Theecult. Nederl.-Indië* [formerly *De Thee*], i, pp. 65–72, 6 pl., 1 graph, 1927. [English summary.]

Two species of black root fungi occur on tea in Java, namely *Rosellinia bunodes* and *R. arcuata* [*R.A.M.*, iii, p. 4], both of which form whitish-grey (later black) hyphae on the outside of the affected roots. *R. arcuata* produces small, white, fan-shaped stars of hyphae between the bark and the wood, while in *R. bunodes* the surface of the wood shows small, irregular, black spots, patches, and stripes. The perithecia of *R. arcuata* measure 2 to 2·5 mm. in diameter, compared with 1·5 mm. for *R. bunodes*; in the latter fungus their surface is finely verrucose.

Other plants attacked by black root fungi in Java include *Leucaena* [*glauca*: ibid., iii, p. 480], *Crotalaria usaramoensis*, and *Indigofera endecaphylla*, while in Ceylon they occur on *Tephrosia candida* and *Erythrina*.

In contrast to most other root fungi, these species of *Rosellinia* occur almost exclusively in neutral, young volcanic soils where the exchange acidity does not exceed 1·0 or the degree of hydrolytic acidity 55·0. Infected areas should be isolated by trenches, dug on porous soil to a depth of at least 1 m. In order to increase the degree of exchange acidity in neutral soil to 2·0 (the limit for *Rosellinia* infection), it would be necessary to apply 100 gm. of aluminium sulphate per sq. m. of soil. A more economical and probably more effective method would be treatment of the soil with alum or colloidal sulphur.

[The English summary of this paper is reprinted in *Planters' Chron.*, xxii, pp. 600–601, 1927.]

Kern (H.). **Ueber das Auftreten einer in Ungarn bisher nicht beobachteten Tabakkrankheit im Jahre 1926.** [On the occurrence in the year 1926 of a Tobacco disease not hitherto observed in Hungary.]—*Angew. Bot.*, ix, 4, pp. 451–458, 1927.

At the beginning of June, 1926, reports were received at the Budapest Institute of Plant Physiology and Phytopathology of the

widespread occurrence of a tobacco disease strongly resembling wildfire [*Bacterium tabacum*: see below, p. 124]. The symptoms appeared suddenly during a lengthy spell of rainy weather and spread with extreme rapidity, necessitating repeated plantings over a wide area. Field observations in the northern province of Szabolc, where the damage was most severe, showed that infection was more prevalent on hot, sandy soils than on cool, compact ones. Plants growing beneath the trees which generally surround the fields, and those situated in low-lying parts of the field, were also comparatively free from infection. The disease was altogether more severe in the cultivated plains than in well-wooded districts. The high-class or 'garden' varieties showed greater susceptibility than the low-grade tobacco.

It is not yet certain whether the causal organism of the new disease is transmitted by the seed, but the fact of its appearance in fields planted with suspected seed suggests that this is the case. As in the United States [*R.A.M.*, v, p. 138], infection was also observed to occur in seed-beds where the prescribed precautionary measures were omitted.

Among the bacteria consistently isolated from diseased material was one which is regarded as the causal organism, but *Bact. tabacum* was not identified during the laboratory investigations.

Control measures should be based on thorough sanitation and scrupulous cleanliness; the use of healthy seed procured from the State Tobacco Board; seed treatment with a mercury compound, such as higosan, uspulun, or germisan; and the application to seedlings and older plants of 1 per cent. Bordeaux mixture or cuprol (a dust containing copper carbonate, dehydrated copper sulphate, and calcium hydrate).

MANDELSON (L. F.). **Black root rot of Tobacco in New South Wales. Thielavia basicola (B. & Br.) Zopf.**—*Agric. Gaz. New South Wales*, xxxviii, 7, pp. 523–531, 3 figs., 1 graph, 1927.

Root rot associated with *Thielavia basicola* (recorded for the first time in New South Wales and, apparently, in Australia) is said to have been responsible for the decline of the tobacco crop in the State to an estimated yield of only 3,000 cwt. in 1927, as compared with 14,000 cwt. in 1926. Affected plants ceased to grow, flowered prematurely, and were woody and with many dead roots.

The plants appeared most stunted when the temperature was below normal and recovered to a marked degree only in those areas where it subsequently rose. Though the low temperature in itself may have been responsible for some of the stunting, the presence of *T. basicola* in the soil is regarded as a more important factor, since it is known that this parasite requires moderately low soil temperatures to enable it to cause severe damage to the plants. The conditions may also have been aggravated by heavy rain in December after a dry period.

The author concludes that *T. basicola* has probably long been present in New South Wales, but that it is not likely to be a frequent source of trouble, since it requires abnormal weather conditions to enable it to become an active parasite.

BERKELEY (G. H.). **Tomato diseases.**—*Canada Dept. of Agric. Bull.* 51, N.S., (revised ed.), 17 pp., 8 figs., 1927.

This bulletin supersedes the author's previous paper on the same subject [*R.A.M.*, iv, p. 638]. In addition to the information contained in the former issue, a note is given on the condition known as oedema, which occurred with exceptional severity at Vineland in 1925, resulting in the loss of half the crop. Numerous small swellings, at first frosty-white and later yellowish-brown and corky, appear on the veins, midribs, petioles, and stems. These protuberances may occur singly or so close together as to form complete ridges and irregular raised areas. The epidermis is finally ruptured, exposing the brownish, warty, cork-like tissue. Badly affected leaves die, and under unfavourable greenhouse conditions (over-heating, excessive watering, and inadequate ventilation), the entire plant may succumb. Control measures should be based on the provision of ventilation and a dry atmosphere.

SIMMONDS (J. H.). **Spotted wilt of Tomatoes.**—*Queensland Agric. Journ.*, xxviii, 1, pp. 28–30, 1 pl., 1927.

This is a brief, popular account of the spotted wilt of tomatoes, due to an unknown cause, and reproduces the information already noticed from other sources [*R.A.M.*, iii, p. 307; v, pp. 213, 636].

KÖNIG. **Ulmensterben in Hamburg.** [Die-back of Elms at Hamburg.]—*Möllers Deutsche Gärtnerzeit.*, xlii, pp. 133–134, 2 figs., 1927. [Abs. in *Centralbl. für Bakt.*, Ab. 2, lxxii, 8–14, p. 347, 1927.]

In July, 1925, a number of elm trees in various parts of Hamburg suddenly developed symptoms resembling those of the die-back attributed to *Micrococcus ulmi* [*R.A.M.*, vi, p. 385]. In the following spring some of the affected trees received injections of various unspecified solutions according to Ilisch's immunization method. Preliminary results indicate that the treatment is likely to prove successful in cases where the disease is not too far advanced.

ROSEN (H. R.). **A pink-colored form of Polyporus sulphureus and its probable relation to root-rot of Oaks.**—*Mycologia*, xix, 4, pp. 191–194, 2 pl., 1927.

A brief macroscopical description is given of a conspicuous Polypore, which, for several years consecutively, was found associated with living oaks presenting symptoms of decay on the campus of the University of Arkansas and also in close proximity to stumps of felled trees. A careful examination in the spring of 1926 of the root system of affected oaks showed that in every instance the fungus grew out of, or was attached to, badly decayed roots, while its whitish mycelium permeated the soil around the rotted roots to a distance of a foot or more.

The fungus appears to be closely related to *Polyporus sulphureus* by the size, shape, and colour of its spores, which fit in very well with Overholts's description of this species (*Washington Univ. Studies*, iii, 1, 1915). It differs, however, in the size (20 to 60 by 14 to 40 by 3 to 10 cm.) and the pinkish-salmon, when fresh, and dirty

white or cream colour when dry, of its pilei, the flesh of which is markedly pinkish for a considerable distance below the upper surface and grades off into creamy white or whitish near the lower surface. Another distinguishing feature is the presence on the surface of the pilei of a noticeable calcareous incrustation which has not been mentioned in *P. sulphureus*. In the author's opinion, in agreement with Overholts, to whom a description of the fungus was submitted, this form is to be provisionally considered as a new variety of *P. sulphureus*, for which the new combination *P. sulphureus* (Bull.) Fries var. *overholtsii* is proposed.

White Pine blister rust.—*Ann. Rept. Commissioner of Agric. Massachusetts for the year ending November 30, 1926*, pp. 22–23, 1927.

Up to 30th November, 1926, white pine blister rust [*Cronartium ribicola*] had been located in 210 townships of Massachusetts, 23 of these being new records during the period under review. The total number of wild and cultivated gooseberry and currant bushes eradicated in 1926 was 1,108,635, at an average cost of 14 cents per acre, the total area covered being 189,080 acres.

PARK (M.). **A Fusarium disease of Dadap (Erythrina lithosperma).**—*Ann. Roy. Bot. Gard., Peradeniya*. x, 3, pp. 275–293, 1 pl., 4 graphs, 1927.

This is a somewhat expanded version of the author's previous paper [*R.A.M.*, v, p. 522] on a die-back of dadap (*Erythrina lithosperma*) caused by an unnamed species of *Fusarium*. A considerable reduction in the average length of the macroconidia occurs in old cultures, but between 20 and 50 days after culturing the length is approximately constant on any one medium, though it varies somewhat according to the medium used.

BAVENDAMM (W.). **Neue Untersuchungen über die Lebensbedingungen holzzerstrender Pilze. Ein Beitrag zur Immunitätsfrage.** [Recent investigations of the conditions governing the existence of wood-destroying fungi. A contribution to the problem of immunity.]—*Ber. Deutsch. Bot. Gesellsch.*, xlv, 6, pp. 357–367, 1927.

On the basis of his own preliminary investigations [which are described], as well as those of contemporary workers, the author distinguishes the wood-destroying fungi into two types, namely, the 'corrosion' and 'destruction' types [*R.A.M.*, vi, p. 453], the former affecting lignin and producing a red rot, and the latter causing a white rot and disintegrating cellulose. The corrosion fungi were found to be capable of utilizing tannin, while those of the destruction type were incapable of assimilating this form of nutriment, probably on account of the resistance of the benzene nucleus. A marked feature of the tannin cultures was the formation by the corrosion fungi of a fair-sized, deep brown to black halo round the mycelium and below the hyphae. This is interpreted as an indication of the alteration by the fungus of the tannins, which have been shown to be closely related to lignin. A further distinction between the two types of xylophage is the dependence of the cellu-

lose-destroying organisms on the presence of oxygen, with which the corrosion fungi can readily dispense.

BOYCE (J. S.). **Losses in windthrown timber.**—Reprinted from *The Timberman*, xxviii, 10, 8 pp., 3 figs., [1927].

In January, 1921, a terrific windstorm swept over Olympic Peninsula, Washington State, uprooting timber, chiefly Douglas fir (*Pseudotsuga taxifolia*), Sitka spruce (*Picea sitchensis*), and western hemlock (*Tsuga heterophylla*) throughout an area of some 1,200 square miles. Observations were made in late August or early September annually from 1921 until 1926 (except in 1925), to determine the rate of decay of the fallen timber, the enormous mass of which formed a substratum of unprecedented size for wood-destroying fungi.

No decay appeared until 1923 owing to the high moisture content of the wood, but in 1924 active progress was noted, and by 1926 the sap wood of all the trees under observation was attacked. Western hemlock and Pacific silver fir (*Abies amabilis*) were then unsaleable, and Sitka spruce showed considerable deterioration, but the loss in Douglas fir and western red cedar (*Thuja plicata*) was comparatively small. The rate of decay in Douglas fir is expected to decrease, the fungi having reached the heart wood, while decay will be even slower in red cedar, but the Sitka spruce, except for very large trees, is expected to be unsaleable in three or four years.

The decay was found to be almost entirely due in the early stages to the red belt fungus [*Fomes pinicola*].

HOWALD (A. M.). **Penetrance of oily fluids in wood. Studies of the effect of oil-peptized colloids on penetrance.**—*Chem. and Metall. Engin.*, xxxiv, 7, pp. 413–415, 4 graphs, 1927.

In continuation of his previous comparisons of the penetration of oily fluids into wood [*R.A.M.*, vi, p. 764], the writer found that pure distillate petroleum oils, e. g., motor cylinder oils, kerosene, &c., and mixtures of these, were highly penetrative and at equal absolute viscosities were sensibly equal in this respect. Compared at a standard viscosity it was ascertained that certain petroleum residuum fuel oils and creosote-petroleum mixtures were equal to distillate petroleum oils in penetration. On the other hand, certain petroleum residua and creosote mixtures with these were, at the same standard viscosity, much less penetrative. Compared under standard treating conditions on Douglas fir [*Pseudotsuga taxifolia*] test pieces, these non-penetrative oils and mixtures gave an absorption of only about one-tenth that of a distillate oil of the same viscosity. Of the oils studied, a sample of Mexican Panuco crude petroleum and one of California residuum were found to have particularly non-penetrative properties.

The data obtained in the writer's experiments [the results of which are tabulated] indicate that low penetration power is associated with the presence of peptized colloids, which are believed to change the capillarity relationship between oil and wood. No consistent connexion could be found between the surface tensions at an oil-air or at an oil-water interface and power of penetration.

Another important possibility in wood impregnation is suggested, viz., that 'penetrance promoters', having an opposite effect to that of the colloids on the capillarity relationship between oil and wood, may be developed.

CRAWFORD (R. F.). **Powdery mildew of Peas.**—*New Mexico Agric. Exper. Stat. Bull.* 163, 13 pp., 4 figs., 1927.

Powdery mildew of peas (*Erysiphe polygoni*) is stated to be usually the limiting factor in the successful production of this crop in the mountainous districts of New Mexico. The symptoms of the disease and life-history of the fungus are briefly described in popular terms. Early infection was found to be reducible to a minimum by twenty minutes' immersion of the seed in water heated to 56° C., while in the field the disease may be controlled by dusting the plants, about the time when the pods are flat, with a mixture consisting of four parts of sulphur to six of hydrated lime.

CUNNINGHAM (G. H.). **Dry rot of Swedes and Turnips: its cause and control.**—*New Zealand Dept. of Agric. Bull.* 133, 51 pp., 29 figs., 1 graph, 1927.

The author describes a series of experiments carried out to devise new methods of control of dry rot (stated to be now the most serious disease of swedes and turnips in New Zealand), which showed that the condition, frequently appearing as it did on virgin land, was not usually soil-borne. Further experiments definitely established the fact that dry rot is seed-borne, the fungus being isolated readily from various commercial samples of swede seed. To determine whether the organism was in the testa or the embryonic cotyledons, 1,000 seeds from a line containing about 4 per cent. of the disease were, after surface sterilization for ten minutes in acidulated mercuric chloride, soaked in distilled water for 24 hours, and the testa dissected from each. These testas and the embryos were then plated separately on nutrient media, and after five days, the dry rot organism was found present in 4 per cent. of the testas, and none of the embryos. On germination, the testa is frequently carried up on the tips of the cotyledons and infects these, producing a small lesion on which pycnidia develop: such pycnidia liberate mucilaginous spore-tendrils when the weather becomes sufficiently damp. Infected seedlings are found in the field about two weeks after the seed is sown. Subsequent spread in the field occurs only when the spores are conveyed on to the leaves or 'bulbs' by contact or by rain splashing, moisture being necessary to free the spores from their surrounding mucilage. This is also said to explain why infected plants occur in small, irregularly circular areas, and not simultaneously over the whole field. Decayed, mummified bulbs may also convey the disease if they are left on the ground until the next crop appears. When swedes are used for seed purposes, the disease spreads from the bulb to the leaves of the flowering spike, and thence to the siliquas, forming lesions from which the mycelium reaches the enclosed seed.

Several hundred isolations of the dry rot parasite and other organisms were made from lesions on leaves of swede, turnip, cabbage, kohlrabi, chou moellier, and rape, and also from the bulbs,

stems, and inflorescences of turnips, swedes, and some other *Brassica* varieties and species. These were grown in pure culture from single spores or hyphal tips, and used for inoculation on swedes. The results [which are given in tabular form] showed that, with the exception of isolations from lesions on leaves of kohlrabi, chou moellier, rape, wild turnip, broccoli stems, rape seed, and swede embryos, all produced noticeable rot within six days. A similar series of inoculations was also undertaken with cultures of strains of *Phoma* from *Brassica* obtained from abroad under various names, most of which also gave positive results.

As similar lesions were found to be produced by strains referred by workers in other countries to different species, a comparative study of these and of the New Zealand strains was undertaken. To define the differences between the various cultural strains found, the author has plotted the growth curves of all the isolations, which are also described in tabular form. These indicated the presence of two main groups of strains, a rapidly growing, weakly parasitic group and a slow growing, strongly parasitic group, both of which can be further subdivided. Saltation occurs in both groups, and is regularly found in certain strains. Authentic cultures of *Phoma lingam*, *P. napo-brassicae*, *P. brassicae*, and *P. oleracea*, obtained from America and Europe, all came within these strain groups, and so close was the morphological resemblance between the pycnidia of the New Zealand strain groups and those obtained in the above-mentioned foreign cultures, that the separation of any one proved impossible.

The author, therefore, considers that all belong to the same species, and that the true name of the fungus is *P. lingam*, of which the following are cited as synonyms, and an amended diagnosis is given: *Phoma lingam* (Tode) Desmazières; *Phoma siliquastrum* Desm.; *Phyllosticta brassicae* (Curr.) West.; *Phoma oleracea* Sacc.; *Aposphaeria brassicae* Thüm.; *Phoma brassicae* Sacc. non Thüm.; *Phoma napo-brassicae* Rostr.; *Plenodomus lingam* (Tode) v. Höhn. The pycnidia are variable in size and shape, globose, depressed-globose, lenticular, or flask-shaped, 130 to 140 μ in diameter; the ostiole is 15 to 20 μ in diameter, papillate or not; the wall is brown in colour, black when naked, 12 to 18 μ in thickness, except at the apex, where it is often much thickened. Another type of pycnidium occurs, in which the wall is laminated, black, and up to 50 μ in thickness. The conidiophores are hyaline, cylindrical, continuous, inevident, up to 8 μ in length. The spores are hyaline, continuous, elliptical, sometimes slightly curved, with ends bluntly rounded, less often acuminate, 3·5 to 6 by 0·8 to 2 μ, and with a large, central nucleus.

Complete control, without injury to the seed, provided it is of high germination capacity, was obtained by steeping the seed for one hour in a 0·25 per cent. solution of semesan at 115° F. As this method demands a higher degree of precision than most farmers can employ, and as it may seriously depress germination in commercial seed, the author suggests that the foreign seed growers from whom the bulk of the New Zealand seed is obtained should treat their 'mother seed' in this way in order to secure a healthy seed crop for export. If such seed were used, the disease

could be eliminated from New Zealand, provided that the farmer were able to rid his premises and implements of the previous season's seed, and sow in land which had not been under species of *Brassica* for twelve months previously.

Cunningham (G. H.). **Dry rot of Swedes and Turnips. Seed shown to be prime carrier of the disease.**—*New Zealand Journ. of Agric.*, xxxv, 1, pp. 1–14, 11 pl., 1927.

This article is an abridgement in popular terms of the technical bulletin by the same author which is noted above.

Rambousek (F.). **Berichte des Forschungs-Institutes der čsl. Zuckerindustrie. CDLXXXIV. Uebersicht über die Feldkrankheiten der Rübe.** [Reports of the Research Institute of the Czecho-Slovakian Sugar Industry. CDLXXXIV. Survey of the field diseases of the Beet.]—*Zeitschr. für Zuckerind. (Prague)*, li, 48, pp. 559–563, 1927.

In this paper the writer gives a key to the principal fungous, bacterial, and physiological diseases and insect pests of sugar beets in Czecho-Slovakia at different stages of development, from germination to storage.

Disease immunity in Beets.—*Facts about Sugar*, xxii, 31, p. 749, 1927.

According to G. H. Coons, U.S. Department of Agriculture Pathologist at Rocky Ford, Colorado, no commercial variety of sugar beet, out of over 1,100 tested, is known to possess any marked degree of resistance to leaf spot [*Cercospora beticola*] or curly top [*R.A.M.*, vi, p. 10]. On the other hand, wild types from the Mediterranean or western Asiatic region were found to possess all degrees of resistance to leaf spot from apparent immunity to extreme susceptibility. These types also proved resistant to curly top.

Townsend (C. O.). **Disease immunity in Beets.**—*Facts about Sugar*, xxii, 33, p. 789, 1927.

Referring to the statement that no commercial variety of sugar beet is known to show marked resistance to leaf spot [*Cercospora beticola*] or curly top [see preceding abstract], the writer considers that too little attention has been paid to the possibilities of individual selection. Practically every field of commercial beets shows some individuals resistant to both these diseases, thus providing ample material for the development of pure immune strains.

Clayton (E. E.). **Effect of early spray and dust applications on later incidence of Cucumber wilt and mosaic diseases.**—*Phytopath.*, xvii, 7, pp. 473–481, 1927.

Investigations were carried out during 1925 and 1926 in Long Island to determine (*a*) the value of the best entomological recommendations for striped beetle (*Diabrotica vittata*) control in restricting the occurrence of cucumber wilt (*Bacillus tracheiphilus*) and mosaic [*R.A.M.*, v, p. 142]; and (*b*) the effect of the addition of Bordeaux mixture to the insecticides.

The results of the tests [which are tabulated and discussed] showed that wilt may be effectively controlled by spraying during June and July with Bordeaux mixture (2–4–50) and 3 lb. lead arsenate plus ½ gall. of miscible oil, or by dusting with lead arsenate-gypsum dust (1–15). The first-named treatment also distinctly reduced mosaic, while dusting gave a slight degree of control of this disease. The use of a stronger Bordeaux mixture than that mentioned above was found to cause stunting and to reduce the yield of the plants. Sprayed plants remained green longer than dusted ones.

Bertus (L. S.). **Fruit diseases of Chillies.**—*Ann. Roy. Bot. Gard. Peradeniya*, x, 3, pp. 295–314, 2 pl., 1927.

A detailed description is given of the morphological and cultural characters of three fungi which were found in 1923 attacking chilli fruits in Ceylon, and which were identified as *Vermicularia capsici* [*R.A.M.*, i, p. 195], *Colletotrichum nigrum*, and *Gloeosporium piperatum* [ibid., v, p. 647]. *C. nigrum* was found to occur in the field both alone and in association with *Glomerella piperata*, which was shown to be genetically connected with it; the form which was observed alone never produced the perfect stage on any of the culture media tested, and is therefore considered to be a non-perithecial strain of the fungus; in cultures it formed, however, small black bodies possessing walls which appeared to be attempts by the fungus to produce perithecia. The perfect stage of *Gloeosporium piperatum* was not found in nature on the fruit, nor could it be obtained in culture; the author considers that if it is finally established that the perfect stage of this fungus, which in the United States and at Pusa, India, has been identified as *Glomerella piperata*, is really the latter, then the Ceylon perithecial strain of *C. nigrum* and the Ceylon *Gloeosporium piperatum* are both the same species, although no evidence on this point could be obtained from his cultures. The formation of setae by *C. nigrum* is not a constant feature, as they may occur in acervuli in one part of the substratum and be absent in others. It is also pointed out that a large number of the conidia of both strains of this fungus produce appressoria at the end of germ-tubes when sown in water, while the conidia of *G. piperatum* do not form appressoria. No perfect stage of *Vermicularia capsici* was found either in nature or in cultures.

Ravaz (L.). **Chronique: Le mildiou.** [Current events: Mildew.]—*Prog. Agric. et Vitic.*, lxxxviii, 27, pp. 5–8, 1927.

Vine mildew [*Plasmopara viticola*], induced by heavy and persistent rain, proved very prevalent and severe during 1927 in the west, south-west, and centre of France. Injury was especially serious in the district of Vienne. On 20th May, a few spots were noticed in this district on the most susceptible vines only, but between 10th and 13th June, all the leaves became affected. Numerous hybrids, such as B. Seyve 822–872, and Seibel 4986–4681, which for ten years had never required attention, suffered severely, in spite of prompt treatment. Siebel 6468, however, remained immune, and the yield of Seibel 5455 did not seem to be

appreciably affected. The Gamay variety was severely attacked, Gaillard 157 mildly.

Mountainous areas in the south, such as in the Gard and Hérault, suffered from local attacks up to July, but the more level areas nearer the sea were comparatively free from injury, occasional spotting being due to spores wind-borne from a distance.

Ravaz (L.). **Chronique : Extension des attaques de mildiou.** [Current events: Spread of mildew attacks.]—*Prog. Agric. et Vitic.*, lxxxviii, 29, pp. 55–59, 1927.

After a week's interval, heavy rain, sometimes accompanied by hail, was again experienced, during the second week of July, 1927, over most of France, when regions which had previously escaped with little damage, such as Hérault and Gard, became involved. Fresh outbreaks of vine mildew [*Plasmopara viticola*] at once occurred, vines already suffering from the condition, and insufficiently protected, sustaining a complete loss of fruit. In the valley of the Dordogne the situation is stated to be as bad as it was in 1910. Gers also suffered severely.

Rives (L.). **Sur la Fusariose (?) du Seibel 4986.** [On fusariosis (?) of Seibel 4986.]—*Prog. Agric. et Vitic.*, lxxxviii, 27, pp. 8–9, 1927.

The attention of the author was directed to the condition of a vine of the Seibel 4986 variety, growing at Beaujolais, which annually for three years previously had lost from 20 to 30 per cent. of its branches. Each August or September, parts of the vine-stock withered, the leaves fell, and the fruit usually dried up, like the leaves, while the rest of the vine remained healthy. The soil was stated to be in perfectly good condition, and in the same vineyard, rows of 5431 were unaffected, but a vine of the variety S 5279 growing in the vicinity was destroyed in two years.

Sections along the axis of the branches showed that the wood fibres were blackened in places. Upon examination, a branching, septate mycelium was found in the vessels of the diseased tissues. Affected branches, split longitudinally and placed in a damp chamber on wet sand, quickly became covered with a mycelium, which subsequently gave rise to the characteristic conidia of *Fusarium viticola*. Sufficient information, however, was not forthcoming to decide definitely whether this fungus was responsible for the condition.

Bachala (A.). **Les poudrages et la protection du vignoble.** [Dustings and the protection of the vineyard.]—*Prog. Agric. et Vitic.*, lxxxviii, 29, pp. 60–61, 1927.

The author strongly recommends the use of dusts containing copper for the control of mildew [*Plasmopara viticola*], black-rot [*Guignardia bidwellii*], and *Oidium* [*Uncinula necator*] of the vine, one such application being regularly made between each two liquid treatments. A dust which is stated to have given excellent results is made by mixing one part copper sulphate talc powder with two parts sublimed sulphur. This should be used for the first two

dustings, after which a mixture composed of equal parts of copper sulphate talc powder and sulphur is advised.

SCHELLENBERG (A.). **Gelbsucht (Chlorose) in Folge ungenügender Bekämpfung des falschen Mehltaues.** [Yellow discoloration (chlorosis) as a result of inadequate control of downy mildew.] —*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxvi, 15, pp. 262–265, 1927.

Vines in the Wädenswil [Zürich] district of Switzerland are stated to be severely attacked by chlorosis, which occurs as a secondary consequence of downy mildew [*Plasmopara viticola*] in insufficiently sprayed plots. The Blue Burgundy variety appears to suffer more from this disturbance than Räuschling and Elbling. The control of chlorosis should be based on improvement in the general health of the vines by suitable cultural practices, including the application of a top-dressing of saltpetre.

KIRBY (R. S.) & ARCHER (W. A.). **Diseases of cereal and forage crops in the United States in 1926.**—*Plant Disease Reporter, Supplement* 53, pp. 110–208, 4 graphs, 15 maps, 1927.

This report, prepared on the usual lines [*R.A.M.*, v, p. 722], contains a summary of the results obtained recently in treating seed-borne diseases of cereals with various organic mercury compounds and also with copper carbonate dust in the United States. The following are some of the many other records of interest. The average loss from disease during the last nine years in the United States wheat crop was 10·2 per cent., the spring wheat area being primarily affected, with an average reduction of nearly one-fifth of its crop.

Flag smut of wheat (*Urocystis tritici*) is still confined to three States, Illinois, Kansas, and Missouri.

Stripe [yellow] rust of wheat (*Puccinia glumarum*) has been found in seven western States, viz., California, Arizona, Utah, Oregon, Idaho, Montana, and Washington, since it was first observed in the United States in 1915.

Wheat and rye leaves were affected in Illinois (the former also in Pennsylvania) by stripe, due to an unknown cause.

Barley was heavily damaged in California by rusty blotch (*Helminthosporium californicum* Mackie & Paxton), to which the Smooth Awn variety No. 1367 has shown a high degree of resistance.

Brown spot of maize (*Physoderma zeae-maydis*) is stated to be primarily a disease of the southern States, outside of which it causes little or no loss. In 1926 infection amounted to an average of 2 per cent. in southern Georgia, 1 per cent. in Mississippi and Louisiana, and 0·5 per cent. in Alabama, while traces were reported from Missouri and Kansas.

Green smut of maize (*Ustilaginoidea* sp.) [ibid., v, p. 723] was reported from Summit, in the [Panama] Canal Zone.

Black smut of rice (*Tilletia horrida*) was reported from Arkansas, apparently for the first time, during 1926. South Carolina and Louisiana are the only other States in which the disease was known

to occur prior to this date, and in no case has it been of great importance.

Buckwheat [*Fagopyrum esculentum*] at New Brunswick, New Jersey, was affected by the virus of aster yellows [ibid., vi, p. 297], which caused indefinite proliferation of the flower heads and abundant production of small greenish flowers on long, rather erect pedicels.

Bacterial rot of lucerne (*Aplanobacter insidiosum*) [ibid., vi, p. 388] was newly reported from Minnesota, making a total of 18 States in which this disease has been found. Heavy losses (25 per cent. of the crop) occurred in Missouri.

Scab of cowpea (*Cladosporium vignae*) [ibid., v, p. 76] was reported from Delaware, Virginia, Alabama, and Arkansas, all of which are new localities for the disease. The Blackeye variety appears to be particularly susceptible, while Iron, Clay, and Hall are immune.

Phoma bakeriana, which is stated to resemble *Phyllosticta phaseolina* [ibid., v, p. 519], attacked cowpea pods in Mississippi.

ADAMS (J. F.). **Department of Plant Pathology.**—*Ann. Rept. Delaware Agric. Exper. Stat. for the fiscal year ending June 30, 1926* (*Bull.* 147), pp. 29–35, 1926. [Received November, 1927.]

Further investigations on the etiology of pox of sweet potatoes confirmed previous evidence as to the responsibility of an actinomycete [? *Actinomyces poolensis*: *R.A.M.*, v, p. 470]. The immersion of pox-infested roots in water was found to increase the activities of the causal organism.

Continued investigations [by T. F. Manns] on the possibility of the transmission of peach yellows and little peach by the curculio [*Conotrachelus nenuphar*] gave negative results.

It has been conclusively proved for the first time that the causal organism of bacterial leaf spot of plum and peach [*Bacterium pruni*] overwinters in the twig cankers, which act as a source of infection during the growing season. A preliminary anatomical examination showed that the organism is not deeply embedded in the host tissue, while its distribution is very restricted and always results from mass action. Considerable disorganization of the affected tissue is observed and large pockets of bacteria occur where the tissue is broken down. Progress appears to be along the intercellular spaces and leads to a gradual engulfment of the cortical cells. The host reaction was found to be much greater in plum than in peach. Field observations during the early growing period of 1926 strongly suggested the buds as a source of infection. Fruit infection appears to follow that of the leaves, probably as the result of dripping during rainy spells. Heavy twig infection appears to be the principal source of leaf infection in the spring. The results of preliminary experiments indicate that chlorophenol mercury, cresol, and sodium fluoride are likely to give good control of this leaf spot.

Two commercial copper dusts and two others containing, respectively, 9 and 15 per cent. copper gave good control of leaf blight of cantaloupes [*Macrosporium cucumerinum*]. As previously re-

ported [loc. cit.], no connexion could be traced between *Alternaria brassicae* var. *nigrescens* and the development of leaf blight.

Severe defoliation of soy-beans occurred in Sussex County as a result of infection by the recently discovered leaf spot [*Septoria glycines*: loc. cit.].

B[acterium] vignae was collected for the first time in Delaware on Lima beans [*Phaseolus lunatus*] in August, 1925.

Crown gall [*Bact. tumefaciens*] was found to be a primary factor in the causation of die-back of Williams apples. The disease occurred on the roots of mulched trees, thus demonstrating the importance of moisture in the development of infection.

A species of *Rhizoctonia* occurred on greenhouse plants of *Impatiens*.

An investigation on the longevity of maize root fungi was begun in 1923 and has been continued since that date with the original samples. *Diplodia zeae* was found to be still viable, while *G[ibberella] saubinetii*, *G. moniliformis*, and *C[ephalosporium] sacchari* showed a marked decline of vitality.

ANIGSTEIN (L.). **Untersuchungen über die Morphologie und Biologie der Rickettsia melophagi Nöller.** [Researches on the morphology and biology of *Rickettsia melophagi* Nöller.]—*Arch. für Protistenkunde*, lvii, 2, pp. 209–246, 4 pl. (1 col.), 1927.

The author has carried out a detailed investigation of *Rickettsia melophagi* [*R.A.M.*, iv, p. 689], both in the host, *Melophagus ovinus*, and in culture. There was no possibility of confusing these organisms with mitochondria as suggested by Woodcock [ibid., v, p. 569]. Five strains were successfully isolated in culture from the intestine of *Melophagus* and from the blood of the sheep. Morphologically they resembled closely the other species that have been described, especially that associated with typhus fever, but they are very pleomorphic. They are regarded as bacteria, allied to *Corynebacterium*, and not as representatives of a separate group of organisms.

WOLLMAN (E.). **Recherches sur la bactériophagie (Phénomène de Twort-d'Hérelle).** [Researches on bacteriophagy (the Twort-d'Hérelle phenomenon).]—*Ann. Inst. Pasteur*, xli, 8, pp. 883–918, 6 figs., 1927.

In this paper the writer develops his theory of the hereditary character of bacteriophagy [*R.A.M.*, v, p. 241] in the light of further researches and experiments, and also gives a discussion of contemporary work on the Twort-d'Hérelle phenomenon.

ISRAILSKY (W. P.). **Bakteriophagie und Pflanzenkrebs.** [Bacteriophagy and plant cancer.]—*Centralbl. für Bakt.*, Ab. 2, lxxi, 8–14, pp. 302–311, 1927.

Of nine cultures of *Bacterium tumefaciens* isolated from beet tumours [*R.A.M.*, v, p. 657], only three were agglutinated by the serum of a rabbit immunized against this organism, and one strain was resistant to the bacteriophage. None of these strains liquefies

gelatine or coagulates milk, they are Gram-negative, and do not form gas on glucose media.

In the autumn of 1926 bacteria were isolated from tumours on the roots of pear trees. These organisms were proved by agglutination tests and by their reaction towards the bacteriophage to be identical with *Bact. tumefaciens*. Certain strains of the organism from pear tumours were also resistant to the bacteriophage. None of these strains coagulated milk. Titration experiments [details of which are given] showed that the amounts of acid formed by *Bact. tumefaciens*, both in culture and under natural conditions, are small, so that the disappearance of the organism from the plant tumours, which appears sometimes to happen, must be attributed to the activity of the bacteriophage and not to acid formation. These data suggest that the presence of the bacteriophage may have accounted for the difficulty experienced by the earlier workers in the isolation of *Bact. tumefaciens* from human and plant tumours. It has been shown, however, that the presence of acid in certain plants contributes in a high degree to their immunity from crown gall [ibid., vi, p. 19].

As in the previous investigations, one-day-old cultures of *Bact. tumefaciens* showed no trace of the presence of the bacteriophage, notwithstanding repeated filtration. In meat peptone-bouillon cultures, however, the addition of only 1 c.c. of filtered tumour extract to 30 to 40 c c. of the culture produced a noticeable degree of lysis. A similar but less pronounced effect was observed on agar cultures after two or three filtrations. The serum of a rabbit immunized against *Bact. tumefaciens* at first prevented the growth of the organism, but after repeated filtration the lytic action was no longer observed.

The quantities of oxidase, catalase, and proteolytic enzymes in healthy plants and in crown gall tumours were determined under uniform experimental conditions. It was found that the amount of oxidase is increased, not only in the tumours but also in the healthy portions of diseased plants, the quantity in the tumour being one and a half times as great as that in the healthy portion of the same plant, and exceeding by two and a half times that occurring in healthy plants. Similar data were obtained for catalase, the amount of which in the tumours was four times as great as that in healthy plants. This intensity of oxidation is thought to be probably responsible for the comparatively rapid decay of the tumours even under favourable storage conditions. The amount of albuminous nitrogen in the tumours was twice as great as that in healthy plants.

In order to ascertain how far the bacteriophage could protect plants already infected by *Bact. tumefaciens* from subsequent infection, young, healthy beet seedlings were immersed by their roots for four hours in an emulsion of an agar culture of the organism, another series of tests was made in which the roots were inoculated through needle-pricks, while a third test was carried out with seeds immersed in a bacterial emulsion for two hours. In each case half the material was planted immediately and half exposed to the action of the bacteriophage in bouillon cultures, for four hours in the case of the seedlings, and for two hours in that of the seeds.

The bacteriophage was found to exert a marked inhibitory effect on the development of the organism in the plants.

HAYES (H. K.), AAMODT (O. S.), & STEVENSON (F. J.). **Correlation between yielding ability, reaction to certain diseases, and other characters of spring and winter Wheats in rod-row trials.**—*Journ. Amer. Soc. Agron.*, xix, 10, pp. 896–910, 1927.

A series of rod-row trials of spring wheats was conducted at Waseca (Minnesota) in 1926 to determine, by means of correlation coefficients, the importance, in relation to yielding ability, of the mode of reaction to certain diseases, together with other agronomic and botanical character differences. Each of the lines studied (mostly obtained from crosses with a view to breeding varieties resistant to stem rust [*Puccinia graminis*] and otherwise desirable agronomically) was grown in three systematically distributed plots of three rows each. The central row of each plot was harvested for the yield trials. Data for all characters were obtained from each plot and the results averaged. All the data are presented in tabular form and discussed. Sensible linearity of regression was indicated by a study of the correlation surface, together with Blakeman's test of linearity. Hence the correlation coefficient was considered to be the best measure of relationship in all the studies, except in connexion with black chaff [*Bacterium translucens* var. *undulosum*: *R.A.M.*, v, p. 150], where the data were taken in categories.

Leaf rust [*P. triticina*] and yield gave a correlation coefficient of −0·3704, and stem rust and yield of −0·0785, while leaf rust and stem rust gave −0·4704. It is apparent that the stem rust-resistant lines are more usually susceptible to leaf rust than are the stem rust-susceptible lines.

All the Kota hybrids proved as susceptible to black chaff as the Kota parent, thereby indicating (since Kota is resistant to *P. graminis*) the probability that genetic factors for reaction to the causal organism of black chaff may be linked with those of resistance to stem rust.

Percentage plumpness of grain was more strongly correlated with yield than any other character, the coefficient of correlation being +0·5101. Stem rust and plumpness of grain are negatively correlated to the extent of $-0{\cdot}2767 \pm 0{\cdot}0881$.

The calculated multiple correlation coefficient of yield in respect of stem rust and leaf rust, date of heading, height of plant, and percentage plumpness of grain was 0·6592. On this basis it was possible to account for 24·8 per cent. of the total variability in yield of the fifty varieties or selections, 24 of which had Kota as one parent, while 22 were purified crosses between Marquis and Kanred, Preston, or Bluestem.

The Ceres and Marquillo varieties recently recommended for distribution in Minnesota are resistant to both stem and leaf rust, but the former is susceptible to loose smut [*Ustilago tritici*] and black chaff, while the latter is less resistant to root rot [*Helminthosporium sativum* and *Fusarium culmorum*: ibid., iii, p. 394] than some other varieties.

In similar trials with winter wheats (mostly crosses between Turkey or Minard and Minhardi) the above-mentioned factors with

the addition of winter injury were studied. A multiple correlation coefficient for yield in relation to these six factors was calculated and a value of R = 0·8961 obtained, accounting for 55·61 per cent. of the variability in production of the winter wheat varieties. All these were apparently susceptible to leaf rust, and it is important to obtain, by selection, varieties combining the desirable characters of Minturki with resistance to this disease. It is apparent that a considerable amount of the variability in yield has not been accounted for by the consideration of the above-mentioned characters. Much of it is clearly due to unknown factors.

Brega (C.). **Prime osservazioni sopra l'influenza dell' epoca della semina sullo sviluppo delle ruggini dei cereali.** [Initial observations on the influence of the date of sowing on the development of cereal rusts.]—*Riv. Pat. Veg.*, xvii, 7–8, pp. 153–156, 1927.

To observe the effect of the date of sowing upon the development of cereal rusts, wheat, chiefly of the Gentil Rosso and Rieti varieties, was sown near Pavia on 20th October, 4th, 15th, 28th, and 29th November, 1926, and on 7th, 21st, and 27th March, 1927. The autumn proved wet and the winter severe. During the first 10 days of May, 39·3 mm. of rain fell, 12·5 mm. during the next 10 days, and 6·7 mm. during the remainder of the month.

Rust first appeared on 18th May, on the Gentil Rosso variety sown on 20th October. The plants then measured 0·8 m. in height, and showed from 4 to 6 leaves, only the lowest of which were affected. About 10 days later, from 10 to 25 per cent. of the leaves showed signs of rust. By the middle of June, the infection was most marked on the last sown wheat, which was still in leaf. The resistant Rieti variety only showed 3 per cent. infection on 28th May. In the surrounding country, in which the wheat was sown between 10th and 20th October, the disease appeared on 10th May.

The first rust observed was *Puccinia glumarum*, when the average temperature was still below 18° C. Later *P. graminis* f. *tritici* proved rather more common, while *P. triticina* was rare and sporadic.

On 4th May, part of the ground was copiously treated with nitrate of soda, and in June the wheat in this part was attacked much more severely by rust than that growing in untreated soil.

The author concludes that, under the weather conditions prevailing during the tests, early sowing conduced to the initial attacks of rust. The outbreak only became serious, however, when the infection became general on plants whilst still young. In the author's opinion, the influence of the date of sowing upon cereal rusts probably varies from year to year according to the periods when the infection spreads.

Rudorf (W.). **Methoden künstlicher Rostinfektionsversuche zur Auffindung widerstandsfähiger Sorten und vorläufige Ergebnisse von Braunrostinfektionen auf etwa 140 Winter- und Sommerweizen-Sorten.** [Methods of artificial rust inoculation experiments for the discovery of resistant varieties and preliminary results of brown rust inoculations on some 140

varieties of winter and summer Wheat.]—*Pflanzenbau*, iv, 3, pp. 36–39, 1927.

In October, 1925, the writer undertook a series of experiments in the inoculation of about 140 species and varieties of winter and summer wheat with the spores of brown rust [*Puccinia triticina*]. The seedlings were sown in small pots (ten in each), eight being inoculated at the time of emergence of the second leaf and the remaining two serving as controls. The spores were sprayed or painted on the leaves and the plants then transferred to moist chambers at a temperature of 20° C. After two to three days they were removed to a greenhouse, where the temperature was not allowed to rise above 22°. The first lesions appeared in six to ten days, followed two to three days later by the development of pustules. In order to intensify the weak light during the winter, Osram-Nitra lamps (1,000 watt) were installed.

Of the 88 varieties of winter wheat showing heavy infection the following may be mentioned: Dippe's, Strube's, Rimpau's, Heil's, Krafft's, and Ackermann's Dickkopf, Geheimrat Aereboe, Svalöf's Panzer II and III, v. Caron's Eldinger, Criewener 104, Michigan Bronze, Little Joss, three Chinese, one Japanese, one Hungarian, one Serbian, and one Egyptian wheat, Turkey C.I. 1571 C, Martin C.I. 4463, White Odessa C.I. 4655, and Hussar C.I. 4843.

Thirty-two summer wheats showed great susceptibility, among them the following well-known varieties: Rimpau's and Strube's Roter Schlanstedt, five types of Bordeaux, Heine's Japhet, Kota C.I. 5878, Pentad durum, and Kubanka.

None of the varieties tested was completely immune, but *Triticum monococcum* proved highly resistant.

TERÉNYI (A.). **Die Wirkung des Wassers und Bodens bei der Kupfervitriolbeize des Weizens.** [The effect of the water and of the soil in the copper sulphate treatment of Wheat.]—*Fortschr. der Landw.*, ii, 16, pp. 517–519, 1927.

The writer conducted a series of experiments [which are tabulated and discussed] on the effect of the composition of the steeping water and the hydrogen-ion concentration of the soil on the efficacy of the copper sulphate treatment of wheat seed-grain [*R.A.M.*, vi, p. 410]. It was found that the bunt [*Tilletia tritici*] spores germinated much better after treatment in distilled water solutions than in those made with tap-water. Germination was also more profuse at a soil hydrogen-ion concentration of P_H 5·2 or 6·3 than at 7·0. These data show the practical importance of the two factors under discussion, and explain the added protection against bunt given by the use of hard water or water containing an admixture of soda and of a judicious adjustment of the hydrogen-ion concentration of the soil.

SIEGWARDT (W.). **Darf mit der 'Trockenbeize Tillantin' gebeizter Weizen an Haushühner verfüttert werden?** [Can Wheat disinfected with tillantin dust be fed to fowls?]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 8, pp. 77–78, 1927.

The results of experiments carried out at the Biologische Reichsanstalt in December, 1926, showed that fowls and pigeons may

safely be fed on wheat seed-grain treated with tillantin dust (150 gm. per cwt.) and subsequently washed and re-dried [cf. *R.A.M.*, v, p. 157]. The health of the birds was maintained and their laying activities were not interrupted.

GASSNER (G.). **Die Frage der Rostanfälligkeit als ernährungsphysiologisches Problem.** [The question of susceptibility to rust as a nutrition-physiological problem.]—*Angew. Bot.*, ix, 5, pp. 531–541, 1 col. pl., 1927.

In this paper the author presents the preliminary results of his investigations (carried out in collaboration with Dr. G. O. Appel and Dr. Straib) on the problem of susceptibility to rust in cereals.

One of the objects of the study was to determine the influence of light on the development of infection by *Puccinia triticina* on wheat, *P. dispersa* on rye, and *P. coronifera* [*P. lolii*] on oats. It was found that increased illumination curtailed the incubation period and augmented the number and size of the rust pustules. Infected plants in a subdued light showed only a discoloration of the foliage without any pustule formation: where the illumination was still further reduced there were no external symptoms, although the germination of the spores and the penetration of the hyphae proceeded normally. During the period from November to February it was found necessary to supplement the natural daylight by powerful electric illumination in order to secure normal infection.

It was shown by the darkening of parts of infected plants that the effects of light and darkness on the development of rust are indirect, being conditioned by the nutritional relations of the host. Infection developed quite normally on partially darkened plants, showing that sufficient carbohydrates are supplied to the obscured leaves to ensure adequate nutriment for the fungus. On the other hand, the withholding of the carbon dioxide supply prevented the development of the uredo stages of *P. lolii* and *P. triticina*. The optimum carbon dioxide content of the atmosphere for the development of rust infection was found to be 0·15 per cent., or higher than the normal amount present in the air (0·03 per cent.). A further increase of carbon dioxide (to 0·75 per cent. and above) resulted in a reduction of infection, possibly owing to the development of some metabolic reaction unfavourable to the growth of the organisms. It is, at any rate, evident that susceptibility to rust infection is, partially at least, correlated with the mechanism of assimilation and with the intensity of this process.

In conclusion, the author briefly discusses several aspects of rust infection which may be elucidated by a consideration of the problem from a physiological standpoint.

GASSNER (G.) & APPEL (G. O.). **Untersuchungen über die Infektionsbedingungen der Getreiderostpilze.** [Investigations on the infection conditions of the cereal rust fungi.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xv, 3, pp. 417–436, 1927.

The section of this paper dealing with the influence of light on the development of infection by the cereal rusts, *Puccinia triticina*

on wheat, *P. dispersa* on rye, and *P. coronifera* [*P. lolii*] on oats, is an amplified account of the work noticed in the preceding abstract.

It was further shown by experiments [the technique of which is fully described, while the results are tabulated and discussed] that the infectivity of all three species is increased by prolonged maintenance of the inoculated material in the saturated atmosphere of a moist chamber. Generally speaking, no infection occurred until the plants had been kept under these conditions for between six and twelve hours, but the different species varied considerably in this respect, while temperature was also an important factor. *P. dispersa* attained almost its maximum infection after 24 hours at each of the temperatures 10°, 15°, and 20° C., while at both the former temperatures *P. triticina* required more than 48 hours to produce the best results. For *P. lolii* 48 hours at 10° was insufficient, while a corresponding period at 20° was adequate and at 15° nearly so. After infection has taken place the degree of atmospheric humidity is of subsidiary importance. Oat leaves inoculated with *P. lolii* and kept continuously under water developed typical discolorations in four to five days, followed a few days later by the formation of normal pustules.

The incubation periods of the different rusts were found to be as follows: 19, 11·1, and 7·8 days for *P. lolii* on oats at 10°, 15°, and 20°, respectively; 19, 11·7, and 8 days for *P. triticina* on wheat; and 15·3, 9·2, and 6·7 days for *P. dispersa* on rye. These data show that a rise in temperature from 10° to 20° reduces the incubation period by more than half, while field observations made during the winter of 1926–7 indicate that below 10° it is disproportionately protracted. A further rise in the temperature to 25° failed to curtail the incubation period of the three rusts tested, and from a greenhouse examination made in the summer of 1926 it would seem that the upper limit for infection is 30°. It was further found impossible to shorten the incubation period by keeping the inoculated plants at fluctuating temperatures. It was also shown that the cultivation of the plants at varying temperatures prior to inoculation made no difference to the subsequent development of infection.

RABIEN (H.). **Ueber Keimungs- und Infektionsbedingungen von Tilletia tritici.** [On the germination and infection conditions of *Tilletia tritici*.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xv, 3, pp. 297–353, 10 graphs, 1927.

A detailed account is given of the writer's extensive investigation on the germination conditions of the spores of wheat bunt (*Tilletia tritici*) in relation to physical and chemical factors, and on the influence of these factors on the subsequent incidence of infection.

There was found to be a progressive decrease in the rate and percentage of germination of the spores from the beginning of the second year after maturity onwards. Fresh spores germinated within 24 hours, and up to a year old in two to three days.

The best results in the germination tests were secured in calcium nitrate solutions [*R.A.M.*, ii, p. 553], but the sodium and ammonium

nitrates also proved satisfactory, and ammonium salts generally were favourable. Both cane sugar and dextrose reduced spore germination, the limiting concentration for germination in the latter case being between 0·01 and 0·001 M, and in the former a little higher. No germination took place in a 0·1 per cent. peptone solution within ten days.

Germination in relation to hydrogen-ion concentration was tested in solutions and also in soils of varying P_H values. The upper limit for germination in solutions was found to be about P_H 4, the addition of calcium nitrate slightly lowering this figure. The corresponding limit on soil was P_H 5. The best results were obtained on compost and fen soils and also on sandy clay, especially in the presence of humus. On acid field soils germination was largely inhibited, while on pure clay no growth occurred.

Of the substances tested for chemical stimulus, positive results were given by a large number of inorganic salts, though none of the mercury salts exercised any appreciable stimulus. The best results were given by gold chloride and potassium permanganate. Further tests showed that pyrogallol and the tannic and oxalic acids also produced stimulation, as well as certain organic mercurial dusts, especially segetan, germisan 225, and the agfa dusts 13 B, 33, and 331. These results were obtained in experiments in soil, and the author thinks that the stimulant may act indirectly, i. e., on the soil and not on the spore. Tests on a plaster of Paris plaque showed evidence of chemical stimulation in the case of potassium permanganate.

The reduction of the oxygen pressure to 400 mm. greatly inhibited the growth of the germ-tubes, and below 300 mm. no germination occurred in distilled water and very little in calcium nitrate. Germination was increased by leaving the Petri dishes uncovered, thereby maintaining the supply of oxygen, and also by the addition to the cultures of oxidizing agents, e. g., potassium permanganate. The abundant germination of the spores in calcium nitrate solution is considered to be due to improved oxygen conditions.

The author's experiments confirmed the data obtained by Hahne (*Arb. Landw. Inst. Univ. Halle*, ix, p. 157, 1925) as regards the influence of temperature and light on the germination of *T. tritici.* The minimum temperature for germination was 5°, the optimum 16° to 18°, and the maximum 20° to 21° C. [cf. *R.A.M.*, iii, p. 512]: the last-named figure was raised to over 25° by the addition of 0·0003 per cent. potassium permanganate. Both Hahne and Riehm (*Jahresber. Biol. Reichsanst.*, xviii, p. 19, 1920) found that light favours germination. Similar results were obtained by the writer only with strong electric light, and he concludes that this is a factor of negligible importance.

The technique employed in the experiments on the relation between spore germination and infection conditions was similar to that used by Hecke (*Zeitschr. Landw. Versuchsw. i. Ö.*, xii, p. 49, 1909) and Gassner [*R.A.M.*, iv, p. 599]. The inoculum was used at 5 gm. of spores to 1000 gm. of wheat. The varieties tested were Strube's General von Stocken (winter) and Strube's Roter Schlanstedt, Heine's Kolben, and Stadler's Weissspelziger (summer). The

results were calculated on the basis of the number of plants bearing bunted ears.

In nearly all the experiments the highest infection occurred on compost, but in some it was in sand and fen soil; the incidence on sandy clay was about half the above, and on peat and acid field soils it was very low. On mixtures of clay and sand or clay and peat the incidence of infection amounted to an average of the bunt percentages of the two components. As in the laboratory experiments described above, no infection occurred on pure clay. Evidence shows conclusively that the differences in the incidence of infection on various types of soil are due to the direct influence of these soils on the spores, and not to a varying degree of resistance of the plants when grown on different soils.

Observations were made on the effect of fertilizers, applied in large doses in boxes, the seedlings being afterwards transplanted to uniform field plots, on the incidence of bunt. Complete inhibition of infection on summer wheat sown in the spring of 1925 was obtained with lime and also with calcium cyanamide, applied at the rate of 200 and 6 cwt. per acre, respectively, while approximately equal results were obtained with ammonium sulphate or potassium nitrate, both at the rate of 28 cwt. per acre. Potash (46 per cent.) and superphosphate (each 28 cwt. per acre) also reduced the amount of infection, but the results with the former were somewhat conflicting in the two varieties tested. In another series of frame experiments with winter wheat sown in the autumn of 1925, complete freedom from bunt was secured by the application of urea at the rate of 2 cwt. per acre for moderate infection and 5 cwt. for severe contamination. Calcium cyanamide was almost as effective, the corresponding quantities required being 4 and 10 cwt., respectively. Sulphate of ammonia (30 cwt. per acre) was equally effective, but potassium nitrate proved less so. The effect of sodium nitrate was remarkably slight in cases of severe contamination. Potash effected a considerable reduction, but superphosphate, basic slag, and lime had to be applied in excessive quantities before producing any result. In a third series of tests with summer wheat sown in the spring of 1926, calcium cyanamide at the rate of 6 cwt. per acre completely eliminated bunt and the results generally agreed with those of the first series of tests on summer wheat.

The fertilizer experiments conducted by means of direct application in the field on wheat sown in May, 1926, gave unsatisfactory results, and in no case was complete freedom from bunt obtained. A complete fertilizer, the same without nitrogen, potash, or phosphates, and lime alone were tried, and the resulting data suggest that the results obtained by applying fertilizers to the soil in boxes are not applicable to field conditions within the limits tested.

Tests of the germination of spores washed from grain taken from fields showed a certain correlation between the abundant germination of spores in the superphosphate and basic slag plots and high incidence of bunt. A correlation in the opposite direction was observed in the case of urea, calcium cyanamide, and Leuna saltpetre, which reduced germination and infection. In other cases no correlation could be found and, in general, the author does not

think that the effect of fertilizers on the incidence of bunt is due merely to their influence on the germination of the spores.

In an experiment to determine the effects of physical and climatic factors on the occurrence of bunt, infected seed was sown in soil and kept at 10° for various periods and then transferred to a greenhouse at 20° to 22°. When seed was inoculated and incubated at the latter temperature continuously no infection occurred, but seed kept at 10° for three, four, and five days developed 0·7, 4·1, and 6·3 per cent. bunt, respectively. When the seed was kept at 10° for eight days there was a sudden rise of infection to about 40 per cent. In another test, inoculated seed was incubated at 5° for one, three, five, seven, nine, and twelve days, respectively, and then transferred to a temperature of 20° to 22°. When kept at 5° for less than nine days the seed developed only a trace of bunt, but after a longer period the percentage rose to 49·1.

An experiment was also conducted to ascertain the effect of the time of sowing on the degree of infection. The lowest temperature recorded between the earliest and latest dates of sowing (14th April and 2nd May) was 6·7° and the highest 14·8°. Every drop in temperature during this period resulted in an increase of bunt, and vice versa. It is quite clear, therefore, that the late sowing of summer wheat greatly reduces the incidence of the disease. Other authors have found that the incidence of bunt is less in early than in late sown winter wheat, but this result was not confirmed in the present tests. Inoculated wheat sown at the end of September or mid-October gave a higher percentage of bunt than that sown in November.

The influence of soil moisture on the incidence of bunt was tested by growing inoculated wheat in very moist, normally moist, and dry soil. The first gave 10·7 per cent. infection, the second 55·3, and the third 22·3 per cent. The bunt-reducing action of a high moisture is attributable to the rapid germination of the wheat, and at the same time to the retardation of spore development by the reduction of the oxygen supply.

KASSEL (G.). **Der Weizenhalmtöter. (Ophiobolus herpotrichus.)** [The Wheat strawbreaker. (*Ophiobolus herpotrichus.*)]—*Illus. Landw. Zeit.*, xlvii, 31, p. 409, 1927.

The wet season of 1927 was characterized by an alarming intensity of foot rot of wheat (*Ophiobolus herpotrichus*) in Mecklenburg, Saxony, and Hanover, even on the resistant Criewener 104 variety, the damage being particularly severe (up to 100 per cent.) on winter wheat following winter and summer barley [*R.A.M.*, vi, pp. 342, 462, 463]. The corresponding incidence of infection on crops following mixed vetch [*Vicia* spp.], beets and oats, and summer fallow was 5 to 20, 0 to 1, and up to 20 per cent., respectively. The disease was much more prevalent on gravel-clay than on clay soil. Weather conditions have been observed to exercise an unmistakable influence on the development of foot rot, which occurred only to a quite negligible extent in the relatively dry year 1925 compared with 1926 and 1927. Infection is believed to persist in stubble and straw but not to be transmissible by the seed.

LILGE (A.). **Der Weizenhalmtöter.** [The Wheat strawbreaker.] —*Illus. Landw. Zeit.*, xlvii, 33, p. 433, 1927.

The writer has obtained excellent results in the control of foot rot of winter wheat [*Ophiobolus herpotrichus*: see preceding abstract] by the substitution of Carsten's Squarehead for Criewener 104, which used to show an annual infection of 5 to 50 per cent. The fungus now seems to have disappeared from the soil, the rye, barley, and summer wheat crops also remaining immune. The seed-grain is steeped regularly, and the healthy state of the crops suggests that infection, contrary to the accepted belief, may be carried on the seed.

MEISNER. **Fusskrankheiten bei Getreide.** [Foot rots of cereals.] —*Illus. Landw. Zeit.*, xlvii, 34, p. 445, 1927.

The virulence of the foot rots of cereals in Baden is stated to have been more intense in 1927 than at any period during the last fifteen years [see preceding abstracts]. The wheat crops were frequently infected by *Ophiobolus herpotrichus*, sometimes associated with *Leptosphaeria herpotrichoides* and *Fusarium* spp., to the extent of 60 per cent. Summer barley was affected only in very damp fields on heavy soil. *L. herpotrichoides* and *Fusarium* spp. caused severe damage to rye. With the exception of Svalöf's Panzer, all varieties of wheat were equally liable to foot rot, those of the so-called 'intensive' Dickkopf type being particularly susceptible. The writer attributes the severity of the disease largely to defective soil drainage, the incidence of infection seldom reaching 5 per cent. on permeable ground. Other injudicious practices contributing to the development of foot rot are too close sowing, excessive applications of nitrogen, inadequate soil cultivation, and the like. The influence of the preceding crop is thought to be of secondary importance, severe infection having been observed after peas, root crops, clover, and barley.

HEITZ (K.). **Fusskrankheit bei Getreide.** [Foot rot of cereals.] —*Illus. Landw. Zeit.*, xlvii, 37, pp. 488–489, 1927.

The writer has found that excessive humidity, while undoubtedly influencing the occurrence of foot rot of cereals [*Ophiobolus herpotrichus* and *Leptosphaeria herpotrichoides*: see preceding abstracts], is of secondary importance compared with the effect of the preceding crop. In irrigated fields at the Berlin-Dahlem Agricultural College, summer wheat following barley showed 100 per cent. infection in 1927, the corresponding figures in the crops succeeding summer wheat, oats, and potatoes being 60, 0, and 0 per cent., respectively. Barley was affected to the extent of 20 per cent. only after barley.

MOLZ (E.). **Der Fusarium- und Schwärze-Befall der diesjährigen Getreide-Aehren in seiner Bedeutung für die nächstjährige Ernte.** [The *Fusarium* and black mould infection of the current year's cereal ears in its significance for the next year's harvest.]—*Deutsche Landw. Presse*, liv, 36, pp. 481–482, 1927.

The writer considers that infection by *Fusarium* has been largely

concerned in predisposing the German cereal crops to the epidemic of foot rot caused by *Ophiobolus* [*herpotrichus*] and *Leptosphaeria* [*herpotrichoides*: see preceding abstracts] in 1927. Apart from the direct loss in the current year, infection by *Fusarium* seriously impairs the quality of the seed for the next year's crop.

Black mould (*Cladosporium herbarum*) was also prevalent on cereals in Germany during the damp seasons of 1926 and 1927, and probably contributed to the development of foot rot. In Sweden and South Russia this fungus is reputed to cause an indisposition of human beings and animals, but this has now been definitely traced to *Endoconidium temulentum*, which sometimes accompanies *C. herbarum* [but see *R.A.M.*, v, p. 543].

Brief directions are given for seed-grain disinfection with standard preparations.

FROHBERG. **Ein Beitrag zur Bekämpfung des Fusariums und Schwärzepilzes beim Roggen.** [A contribution to the control of *Fusarium* and black mould in Rye.]—*Deutsche Landw. Presse*, liv, 36, p. 488, 2 figs., 1927.

Severe outbreaks of *Fusarium* disease (*F. nivale* and *F. minimum*) [*Calonectria graminicola*] and black mould (*Cladosporium herbarum*), favoured by the abnormally heavy rainfall, caused serious damage to the rye crops in the Altmark district of Germany in 1927 [see preceding abstract]. The importance of *C. herbarum* as a limiting factor in German cereal yields has been largely underrated of recent years. Seed treatment against this organism, as well as against *C. graminicola*, should be regularly undertaken. In a recent series of seed disinfection tests, the best control of *Fusarium* disease was given by the so-called G.K.V. process (short germisan treatment), in which 50 kg. of seed-grain are treated for three to five minutes with 1 l. of a 1 per cent. germisan solution [*R.A.M.*, vi, p. 475]. The incidence of infection was reduced from 41 to 1 per cent. by this treatment, carried out in a Primus B or Puk apparatus [ibid., vi, p. 605]. The writer has succeeded in reducing the cost of disinfection by Pf. 10 to 15 or more per cwt. by the use of the short process. Fifteen minutes' immersion in 0·25 per cent. germisan also gave satisfactory results, but the other six preparations tested proved inadequate.

NILSSON (G.). **Das Beizen von Saatgut gegen Fusarium.** [The disinfection of seed-grain against *Fusarium*.]—*Nachricht. über Schädlingsbekämpf.*, ii, 3, pp. 139–140, 1927.

In a series of germination tests carried out by the Värmland branch of the Swedish Seed Association at Svalöf, the germinative energy of Goldregen and 01164 oats was raised from 75·3 to 95·3 per cent. and from 79·0 to 89·3 per cent., respectively, and that of Gold barley from 53 to 79·1 per cent. by dusting with tillantin R (formerly uspulun dust) for the control of *Fusarium* [*Calonectria graminicola*]. The corresponding figures for one hour's immersion in 0·25 per cent. uspulun were 95·7, 89·3, and 80·3 per cent. The

latter treatment also increased the germinative energy of Sieges oats from 67·7 to 85·3 per cent.

ÜBERLHOER (W.). **Fusarium und Trockenbeize.** [*Fusarium* and the dry method of disinfection.]—*Nachricht. über Schädlingsbekämpf.*, ii, 3, pp. 141–142, 1927.

Very good results have been obtained in the Bad Salzungen district of Thuringia by dusting rye seed-grain with tillantin for the control of *Fusarium* [*Calonectria graminicola*]. The Ideal and Lothrä apparatus [*R.A.M.*, vi, p. 475] are both in use by the co-operative societies: the latter has been found the easier to empty.

RIPPEL (A.) & LUDWIG (O.). **Ueber den Einfluss des Ernährungszustandes der Gerste auf den Befall durch Pleospora trichostoma (Streifenkrankheit).** [On the influence of the nutritional condition of Barley on infection by *Pleospora trichostoma* (stripe disease).]—*Angew. Bot.*, ix, 5, pp. 541–560, 1927.

A series of experiments was carried out to determine the effect of the principal nutrients on the incidence of stripe disease of barley (*Pleospora trichostoma*). The methods used were similar to those employed by Schaffnit and Volk [*R.A.M.*, vi, p. 570], the plants being grown from seed in pots filled with sand and receiving varying quantities of K_2SO_4, $CaHPO_4$, NH_4NO_3, and combinations of these substances.

The incidence of infection was uniformly higher in poorly nourished plants, but the resistance in better nourished individuals was apparently not correlated with the specific action of any particular nutrient. This seems to conflict with the results obtained by Schaffnit and Volk [loc. cit.], who found that plants deficient in nitrogen and phosphorus showed a higher degree of resistance. An explanation for this apparent contradiction may be found in the distinction between syngenic and metagenic parasites (the former originating in the seed or bud and infecting the whole plant, while the latter only cause localized infection). It is evident that, in the case of a syngenic fungus such as *P. trichostoma*, the symptoms are more severe in under-nourished plants with a reduced area for infection. It has further been shown [loc. cit.] that in the case of young plants metagenic parasites act similarly on differently nourished individuals, whereas in older ones the reaction varies according to the nutriment received. On the other hand, rapidity of development of the plants is the decisive factor in the case of infection by a syngenic fungus. Thus the growth of the latter is relatively retarded by a plentiful supply of any form of nutriment which enables the plants to outdistance the parasite at the critical stage for infection.

The disease was found to develop to a greater extent in plants from seed germinated at low temperatures in the open than in those kept indoors. The effect of this factor was more marked than that of nutrition.

Steeping the seed in distilled water or 2 per cent. magnesium chloride failed to stimulate growth or control infection.

HEUSER (W.). **Beizversuch zur Bekämpfung der Streifenkrankheit der Gerste.** [Disinfection experiment in the control of stripe disease of Barley.]—*Nachricht. über Schädlingsbekämpf.*, ii, 3, pp. 142–143, 1 fig., 1927.

In an experiment carried out near Cologne the incidence of stripe disease of barley [*Helminthosporium gramineum*] was reduced from 55 per cent. to practically nil by immersion in uspulun or dusting with tillantin R. The yield of grain was increased from 5·90 to 13·35 (tillantin R) and 13·37 cwt. per hect. (uspulun), the corresponding figures for straw being 10·5, 20·4, and 19·9 cwt., respectively.

RAEDER (J. M.) & HUNGERFORD (C. W.). **Dust treatments for the control of Oat smut in Idaho.**—*Phytopath.*, xvii, 8, pp. 569–570, 1927.

In this brief note on the results obtained in 1926 at the Idaho Agricultural Experiment Station in experiments with various dusts for the control of oat smuts [*Ustilago avenae* and *U. levis*], it is stated that, contrary to the results of former tests [*R.A.M.*, v, p. 603] and to Thomas's findings [ibid., v, pp. 356, 414], absolute control of smut in hulled oats was attained with copper carbonate at the rate of 3 oz. per bushel, while the hull-less variety showed only 0·33 per cent. infection with the same treatment. Mercuric chloride in combination with various fillers (in the proportion of two parts mercuric chloride to one part filler) gave complete control in five out of six tests, there being only 0·09 infection in the sixth. Compared with Thomas's results, these tests would indicate that combinations of mercuric chloride with fillers in proportions other than the above are not effective. None of the other dusts tested, comprising Dupont dusts Nos. 49 and 52, semesan, Bayer dust, and colloidal copper, was as efficient as mercuric chloride or copper carbonate. The germination of hull-less oats treated with formalin, either by dipping (at the rate of 1 in 320) or by sprinkling with 1 in 1 or 1 in 10 solutions, was very seriously impaired.

FISCHER (E.). **Der Jahreszyklus der Uredoform von Puccinia dispersa Erikss. et Henn. (Braunrost) des Roggens.** [The annual cycle of the uredo stage of *Puccinia dispersa* Erikss. et Henn. (brown rust) of Rye.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxvii, 7–8, pp. 202–208, 1927.

In the vicinity of Berne, where the author's studies were conducted, the aecidial host (*Anchusa arvensis*) of brown rust of rye (*Puccinia dispersa*) occurs only sporadically and very rarely bears aecidia, and the fungus is therefore practically always obliged to pass its entire life-cycle in the uredo stage on rye.

On 6th January, 1926, fresh uredosori were observed on a rye crop growing at an altitude of 485 to 490 m. above sea-level, and a month later fresh, healthy uredospores of *P. dispersa* were collected and found to germinate freely. On 2nd April and 2nd May only isolated uredosori were found. On 6th June the lower leaves of the rye plants in the fields inspected during the winter bore many uredo- and some teleutosori. These observations indicate that, at any rate during a relatively mild winter, the rust is able to persist

on the plants in the uredo stage apparently as a result of the overwintering of the mycelium, and possibly even to give rise to new infections on exceptionally warm days. Although the winter of 1926–7 was considerably more severe than that of the previous year, young uredosori of *P. dispersa* were found in the same district on 28th February, 1927.

Further observations showed that the fungus bridges over the period elapsing between the harvest of the rye crop at the end of July or beginning of August and the sowing of fresh seed in the middle or end of September by the infection of self-sown plants in the field. The evidence for the anolocyclic development of *P. dispersa* on rye in the absence of its alternate host is, therefore, complete.

GAUL. **Beizversuche zur Bekämpfung des Schneeschimmels bei Roggen am Fusse des Thüringer Waldes.** [Disinfection experiments in the control of the snow mould of Rye on the fringe of the Thuringian forest.]—*Nachrichtenbl. über Schädlingsbekämpf.*, ii, 3, pp. 136–139, 3 figs., 1927.

In order to guard against winter injury to the rye crop, farmers in the Hildburghausen district (on the fringe of the Thuringian forest) are accustomed to use large quantities of seed-grain (up to 60 or 75 kg. per 0·25 hect.). Nevertheless the stands are frequently decimated by *Fusarium* [*Calonectria graminicola*] owing to neglect of the essential practice of seed disinfection. Excellent results in the control of the snow mould were obtained by dusting with tillantin, the number of plants in two small plots sown with seed at the rate of 62·5 and 40 kg., respectively, per 0·25 hect. being 288 and 160, compared with 10 and 8 in the untreated controls. In another test, in which a mixture of rye and wheat was sown, the latter developed normally while the former was severely attacked. The comparative freedom of wheat from infection by the snow mould accounts for its frequent mixture with rye in this district. Healthy stands of pure rye can, however, be readily obtained by seed disinfection.

PORTER (C. L.). **A study of the fungous flora of the nodal tissues of the Corn plant.**—*Phytopath.*, xvii, 8, pp. 563–568, 1927.

The investigation described in this paper was made during the summer of 1926 with a view to ascertaining whether the decomposition frequently observed in the nodal tissues of living and otherwise healthy maize stalks may be related to the activity of parasitic micro-organisms or to other causes. Over two thousand platings were made from maize stalk nodes, originating from a wide range of localities in the eastern United States. The results showed the presence in the tissues of a great variety of organisms, mostly saprophytic, amongst which were *Fusarium moniliforme* [*Gibberella moniliformis*], *Rhizopus nigricans*, *Diplodia zeae*, *Cephalosporium acremonium*, *Cephalothecium* [*Trichothecium*] *roseum*, *Helminthosporium gramineum*, and *Cylindrocephalum* sp., besides other species of common mould genera, yeasts, and bacteria. The characters of eight species of the latter are given. There was no growth in 12·7 per cent. of the total number of platings, the percen-

tage of sterile platings increasing progressively as the node tested was situated higher up the stalk. No close correlation could be established between the kind of fungi in the nodal tissues and the type or degree of fertility of the soil. It was noted, however, that in plants containing a reserve of potassium there was a greater tendency for the tissues to be healthy and sterile, while platings from plants containing accumulations of iron almost always yielded organisms. In concluding, the author states that the decomposition of the nodal tissues of maize stalks cannot be ascribed primarily to any single one, or any group, of the organisms found.

STONEBERG (H. F.) **The productiveness of Corn as influenced by the mosaic disease.**—*U.S. Dept. of Agric. Tech. Bull.* 10, 18 pp., 7 figs., 1927.

Experiments were carried out at Baton Rouge, Louisiana, in 1925 and 1926, to determine the effect of mosaic disease on maize, which has been very widely affected by it in the sugar belt area of recent years, especially in fields adjacent to sugar-cane.

The disease appeared to have no effect on the rate of growth or the total height of the maize plants. There was a slight tendency to increased suckering in diseased individuals, and to the production of a few more ears. The yields from affected plants were appreciably lower than those from healthy ones, the largest difference in acre yield being $3{\cdot}8 \pm 0{\cdot}69$ bushels, or less than 10 per cent. A larger proportion of the ears from healthy plants were in the marketable class, and such ears were slightly better filled. These differences, however, were of no great importance.

On the basis of the data secured up to the present, mosaic disease would seem to be slightly detrimental to the yield and quality of maize, but it cannot be considered an important factor in the decrease of production.

CARNE (W. M.). **Smut on Broom Millet and other Sorghums.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., iv, p. 348, 1927.

The importation of millet [*Andropogon sorghum*] for broom making into Australia now being forbidden, this crop is likely to become important in Western Australia, and as kernel smut (*Sphacelotheca sorghi*) was already reported on a broom millet crop in the Great Southern district in 1927, and on Kaffir corn in the South-West in 1926, growers are recommended to treat their seed with copper carbonate dust at the rate of one oz. per bushel.

READ (F. M.) & TINDALE (G. B.). **The storing of Lemons. A further experiment.**—*Journ. Dept. Agric. Victoria*, xxv, 8, pp. 496–498, 1 fig., 1927.

In a further experiment in the storage of lemons in Victoria [*R.A.M.*, v, p. 668], the fruit was picked during the third week in October, 1926, loosely placed in newspaper-lined benzene cases, sweated for a week, and brought to Melbourne, where it was stored at ordinary temperatures. A stack of 36 cases was covered with a canvas tent fitted over a hardwood framework and containing a dish of water in order to maintain a fairly high degree of

humidity. Under these conditions the lemons were kept from the third week of October, 1926, to 11th January, 1927. No infection by blue mould [*Penicillium italicum*] was observed, but *Botrytis cinerea* occurred in a few cases. In spite of slight shrinkage, the fruit was in excellent condition and was sold for £25, giving a margin of profit of £12 8*s*. The experiment paid for itself amply, even including the whole cost of the fixtures, and this method of storage can be recommended to growers having suitable sheds reasonably free from severe draughts. In the warmer parts of the State the inside surface of the tent should be painted with a solution of 3 lb. paraffin, 1 gall. petrol, and 1 gall. boiled linseed oil.

BUNTING (R. H.). **Diseases of Cocoa and measures for their control.**—*Proc. First West African Agric. Conf.*, pp. 86–97, 1927.

The following fungi are stated to be associated with root diseases of cacao in the Gold Coast Colony: *Fomes lignosus* causing white root disease, *F. lamaoensis* causing brown root disease, *Armillaria mellea* causing collar crack [*R.A.M.*, vi, p. 659], *Ustulina zonata*, occasionally reported on dead trees but not definitely known to be pathogenic to cacao locally, and an unidentified species of *Rosellinia*. This last fungus has only been found occasionally on young, dead cacao trees; it produces an external mycelium resembling sodden, greenish-black hair; while delicate, fan-shaped and parallel lines of white mycelium are found between the bark and the wood. Coremial conidiophores occurred in the field, and when the natural substratum was placed in a damp chamber, black, rugulose, globose perithecia with smooth, mammiform ostioles were formed.

The only important fungus attacking the stems of cacao in the Gold Coast is *Phytophthora faberi* [ibid., vi, p. 657]. Teratoid hyperplasia occur rather infrequently in one European plantation. The condition, which is apparently not communicable, consists in the production of an abnormally large number of flowers without resultant fruit. Tumours form on the stem and branches, apparently composed of bud tissues. The causal organism is suspected to be *Bacterium tumefaciens*.

A leaf affection associated with at least four distinct organisms, of which the commonest, and the only one so far determined, is *Marasmius scandens* [ibid., iv, p. 68], occurs on wet farms, and is known as white thread. The algal red rust caused by *Cephaleuros mycoidea* is found more often on young twigs than on leaves.

The relative incidence of the various pod diseases has been recently investigated [ibid., vi, p. 657]. Another pod affection known as stripe disease is still under study [ibid., vi, p. 144]. The external symptoms of this disease are blotchy, reddish-brown to black, somewhat depressed discolorations, usually along those ridges of a pod which are exposed to the maximum light; internally, grey mucilaginous lesions, consisting of separated cells and bounded by zones of blackened tissue, occur in the pericarp and extend from the apical end of the pod in a longitudinal direction on the upper side. Ashby is stated to consider the organism isolated from these

lesions to be *Bacillus aroideae*. It appears to be a wound parasite consequent upon insect punctures.

A greater number of organisms are concerned in the internal mouldiness of cocoa beans than was at first suspected, and in many cases several occur more or less profusely in the same bean. Most are species of *Aspergillus*, and two of the commonest belong to the *flavus* and *tamari* groups of this genus.

General notes are given on the control of these diseases by cultural and sanitary measures.

LAYCOCK (T.) & JONES (G. H.). **Fungoid pests of Cotton.**—*Proc. First West African Agric. Conf.*, pp. 146–158, 1927.

Details are given of experiments in Nigeria on internal boll disease of cotton associated with *Nematospora gossypii* [*R.A.M.*, vi, p. 353], establishing that the fungus is transmitted by cotton stainers [*Dysdercus superstitiosus* and other species], but all attempts to observe *N. gossypii* on or in the bugs have failed, nor has the fungus been noted in the fruits of any of the alternative host plants of these insects in Nigeria. Injury caused by cage-bred stainers was confined to the point of puncture, and the lint on adjacent undamaged seeds was clean and normal, but in experiments where field stainers were used the lint was stained to a variable distance from the wound, according to the time of infection. Young bolls are more severely affected than old ones, as the contents are more susceptible and the fungus has more time to develop. Infection did not take place in old bolls when inoculated with a spore suspension, but readily occurred in young bolls. The average percentage damage caused by *N. gossypii* to open locks for three seasons at four stations in Nigeria in the case of the American Allen, Meko, and Ishan varieties was 22·8, 11·8, and 9·2, respectively.

Anthracnose (*Glomerella gossypii*) was prevalent on certain plots of Ishan cotton during 1926–7, but its incidence fluctuates greatly in different seasons, being apparently related to the low temperatures and adverse effect on the plant of severe harmattan winds. A boll rot associated with an undetermined species of *Fusarium* [ibid., v, p. 425] also occurs and is much more commonly found also on other parts of the plant than anthracnose, which is usually restricted to mature bolls. In 1925 the *Fusarium* was found to induce bud shedding, the tissues of infected buds being blackened and rotted. Inoculation experiments by needle pricks with a spore suspension obtained from a pure culture of the fungus gave ten infections out of twelve and all the infected buds were shed within six days. No shedding occurred when unwounded buds were sprayed with a spore suspension.

Other fungi of minor importance in Nigeria as boll rotting agents are *Diplodia gossypina* [*Physalospora gossypina*: ibid., v, p. 90], which is stated to be indistinguishable from the fungus [*Botryodiplodia theobromae*] associated with die-back of cacao [ibid., vi, p. 127], and an undetermined species of *Cephalosporium* which was shown by needle prick inoculatious to be capable of rotting the bolls in five days.

The relative importance of the various local cotton diseases are indicated [cf. ibid., vi, p. 228], and control methods are suggested.

MASSEY (R. E.). **On the relation of soil temperature to angular leaf-spot of Cotton.**—*Ann. of Botany*, xli, 163, pp. 497–507, 1927.

Details are given of experiments made by the author in 1925 and 1926 with a view to determining the factors that predispose cotton seedlings in the Sudan to the development of the black arm and angular leaf spot disease (*Pseudomonas* [*Bacterium*] *malvacearum*) from internal seed-borne infection [*R.A.M.*, vi, p. 225]. The experiments, as well as field observations in the Sudan in 1926, supplied evidence to show that the development of the disease in the early stages of growth of the host is restricted within a definite range of soil temperatures, the infection being most severe at soil temperatures between 21° and 26° C. (recorded at a depth of two inches) and gradually decreasing in intensity both below and above these points; at 30° the host appears to be immune from the attacks of the organism. The presence of the parasite within the seed used was demonstrated by sowing seed from infected plants after treatment by immersion for 20 minutes in concentrated sulphuric acid, followed by disinfection in 1 in 1,000 mercuric chloride, and washing with distilled water. After 12 days the seedlings (in large Erlenmeyer flasks with nutrient media) showed the characteristic lesions under suitable conditions, and the organism was isolated.

In pure culture on potato agar the bacterium grew satisfactorily at 11·5°, the lowest temperature tested, but the most vigorous growth occurred at temperatures from 20° to 24°; above 32° the growth almost ceased and none took place at 37°. When heavily diseased seedlings that had been grown at an average soil temperature of 24·2° to 25·2° were transferred to a temperature of 28° to 30°, the new growth that subsequently appeared was quite free from the disease.

Rain was found to be the usual cause of the depression of the soil temperature in the Gezira region to a point which led to the development of the disease. Its effect on lowering the soil temperature can be judged from the cases recorded where the drop was from 46° to 25° in a short period.

The results of two experiments in which cotton plants were sprayed with suspensions of the organism gave indirect support to Faulwetter's conclusions in respect of the spread of the disease in the field by rain.

ROSEN (H. R.). **The control of Cotton wilt by the use of organic fertilizers.**—*Science*, N.S., lxv, 1695, pp. 616–617, 1927.

In view of the results of his previous experiments [*R.A.M.*, vi, p. 291], in which filtrates of pure cultures of different strains of *Fusarium vasinfectum* grown in media containing organic nitrogen proved non-toxic to cotton plants, the author suggests that cotton wilt may be controlled by the use of organic fertilizers. If the disease is severe and cannot be attributed to an abundance of soil-inhabiting nematodes, the soil will probably be found to be poor and deficient in organic matter, while if nematodes are present, the addition of such matter, though it does not preclude the development of wilt, must tend, by stimulating plant growth, to reduce infection.

In the author's opinion, *F. vasinfectum* is a wound parasite (depending for its entry on injuries caused by nematodes and the like), which after entering the root passes a semi-parasitic existence within the water-conducting vessels, largely confining itself to the non-living material. The living tissues must be killed or greatly weakened in advance of the mycelial invasion before the fungus will grow and fructify. This view is in part supported by the fact that inoculum applied to the top of a plant does not induce infection on living parts.

FULTON (H. R.). **Organic fertilizers and Cotton wilt control.**—*Science*, N.S., lxvi, 1704, p. 193, 1927.

After a brief reference to the work of Rosen [see last abstract], the author states that his recommendation of the use of stable manure and other organic material as a means of control of cotton wilt, made in 1907 (*Louisiana Agric. Exper. Stat. Bull.* 96), was based on two seasons' tests at Baton Rouge, on land heavily infected with *Fusarium vasinfectum*, and in which root-knot nematodes [*Heterodera radicicola*] were also present. This method should be adopted in conjunction with other measures, such as planting wilt-resistant varieties of cotton, and crop rotation. In further support of his opinion, the author also refers to the investigations of King and Loomis on the beneficial influence of organic fertilizers in the control of cotton root rot caused by *Phymatotrichum omnivorum* [*R.A.M.*, v, p. 426].

SHAPOVALOV (M.). **The two most common decays of Cotton bolls in the southwestern States.**—*Journ. Agric. Res.*, xxxv, 4, pp. 307–312, 2 pl. (1 col.), 1927.

A decay of cotton bolls resembling the pinkish rot caused by *Aspergillus niger* [*R.A.M.*, v, p. 425] and confused with it in the south-western States, was identified by the author as due to *Rhizopus nigricans* [ibid., iv, p. 540]. Both organisms are regarded as mainly wound parasites associated with insect injury, and in both cases decay sometimes spreads within the boll, breaking through at a distance from the wound.

The *Rhizopus* decay is characterized by an olive-green discoloration of the capsule, which darkens to brown or reddish shades as the decayed parts dry up. The interior tissues of a freshly decaying boll vary in colour from steel-grey to light purple, with shades of pink and yellow, especially in the seeds. Decay is more rapid than that due to *A. niger*.

Both organisms were isolated from discoloured pedicels, dying small 'squares', and spots on the bracts. They frequently occurred on stem lesions of cotton seedlings showing symptoms of sore shin [ibid., v, p. 19; vi, p. 15].

Control measures must be directed against insect injury.

KING (C. J.) & LOOMIS (H. F.). **Factors influencing the severity of the crazy-top disorder of Cotton.**—*U.S. Dept. of Agric. Bull.* 1484, 22 pp., 6 pl., 5 diags., 1927.

In November, 1925, the writers found that acromania or the crazy-top disorder of cotton [*R.A.M.*, iii, p. 273; iv, p. 166] was

present on Pima-Egyptian and Upland varieties throughout the Salt River Valley, Arizona, where more than half the fields were affected, and that the condition was also affecting scattered areas in the Casa Grande Valley, and was becoming of considerable economic importance. It appears in rather definite spots in the fields, but if cotton is grown continuously it may extend over the whole field, except where improved cultural and irrigation methods are practised. The worst cases were associated with soils of unusual cementing properties, or with those where impervious layers occurred two or three feet below the surface. Fields were also observed in which the only large areas of plants not seriously affected were narrow strips at the lower end of the borders, where standing water had had time to penetrate the soil. It was also found that in affected fields there was a general tendency to shallow rooting, in contrast to the deep-rooting of plants in alluvial soils where the disorder did not exist.

Crazy-top was always more prevalent and pronounced in areas cropped to cotton for several successive years than where cotton followed a crop of lucerne. Affected plants may recover, at least partly, the Pima-Egyptian variety being better in this respect than Upland. In late August, 1924, a field of Acala cotton showed numerous affected plants, but by the middle of October the disease was scarcely visible.

Inoculations of healthy plants with the juice of affected tissues in 1923 and 1924 gave negative results, as did attempts to transmit the disease by means of soil from severely diseased areas.

The control measures recommended consist in rotation with lucerne and the improvement of the supply of moisture to the deeper rooting layers.

BURNS (A. C.). **Investigations on raw Cotton. Deterioration of Cotton during damp storage.**—*Min. of Agric. Egypt, Tech. & Sci. Service, Bull.* 71, 92 pp., 3 figs., 2 graphs, 8 charts, 1927.

In connexion with his extensive investigations on the deterioration of cotton during damp storage, the writer isolated the following fungi from seed-cotton stored under slightly damp conditions for three months and exposed to a light rainfall three days before sampling: *Aspergillus fumigatus*, *A. flavus*, *Sporotrichum radicicolum*, an undetermined *Fusarium*, a new species of *Penicillium*, *P. africanum*, and *P. roseum*. Seven types of cellulose-decomposing bacteria were also found.

It would appear, from the microscopic examination of cotton hairs previously subjected to the sodium hydrate-carbon disulphide swelling reagent [*R.A.M.*, iii, p. 37], that certain fungi can penetrate the hair either at the open fractured end or at some weak point or fracture in the wall, and continue to grow along the central canal, whence they may re-emerge through the wall as a result of pressure [ibid., iv, p. 134]. Such organisms may produce a type of deterioration distinct from that associated with the decomposition of cellulose.

The results of storage experiments with Sakellarides cotton showed that bacterial and fungous infection should be sought and controlled in the unginned material. Cotton exposed to very damp

storage prior to ginning was found to be much less resistant to infection during subsequent normal storage than cotton stored under dry conditions from harvesting to ginning. In one experiment the deterioration occurring in material stored at a temperature of 27·1° to 27·5° C., with a relative humidity of 89, amounted to between 18 and 29 per cent. after 86 days. The ventilation of cotton during storage should be supplemented by sun-drying before baling.

SMITH (K. M.). **An unusual form of parasitism of an Anthomyid fly.**—*Parasitology*, xix, 2, pp. 260–262, 1 pl., 1 fig., 1927.

In the course of a study of the bionomics of the cabbage root fly, *Hylemyia* [*Phorbia*] *brassicae*, a small number of this and a closely allied species were observed in the field to be attacked by what appears to be a hitherto undescribed form of fungous disease. The parasitized flies presented a rounded, somewhat swollen abdomen, on the ventral side of which appeared a very large, circular, crater-like orifice (more rarely two were found), with clean-cut, rounded lips covered with chitin which also passed a little way into the interior of the cavity. Internally the abdomen was found to contain a large cyst, while all the normal organs were either destroyed or compressed into a small space dorsal to the cyst. In one case, the abdomen contained two independent cysts. At no time were any external masses of hyphae observed, either on the still living or dead flies.

The cyst is oval in shape, with a central lumen opening into the crater-like orifice. It has thick walls composed of hyphae set in palisade formation. The latter are large, unbranched, continuous, strongly vacuolated, occasionally packed with numerous, deeply staining granules, and contain a number of very large nuclei, which occur at fairly regular intervals and occupy the whole width of the hyphae. These nuclei may also occur as rod-shaped bodies of considerable length. Large pear-shaped, thick-walled spores, each containing a large nucleus and two or three vacuoles, are budded off terminally from conidiophores which project into the central cavity, somewhat after the manner of spore formation in *Empusa muscae*. No other stages in the development of the fungus were found, and the scarcity of the material so far collected does not allow of determining the identity of the organism. It is stated, however, that it partakes of many of the characters of the Entomophthoraceae, to a certain degree resembling species of *Empusa* [cf. *R.A.M.*, vi, p. 725], but also differing from the latter in many respects.

Although the mode of infection of the flies has not been established, a histological examination of infected specimens pointed towards some connexion between the tracheal system of the host and the fungus, as the abdominal spiracles were found to be filled with thin, thread-like hyphae which, however, differed in appearance from the hyphae in the abdomen.

LEWIS (P. M.). **Otomycosis: report of three cases.**—*Journ. Amer. Med. Assoc.*, lxxxix, 2, p. 112, 1927.

The writer describes three cases of otomycosis occurring in two women of 40 and 26, respectively, and in a man aged 20. All three

cases were characterized by the development of large masses of fungous growth, completely covering the membrana tympani and lining of the bony canal wall. In the first patient the colour of the mass was whitish-grey, in the second yellowish-white, and in the third dirty grey. *Aspergillus flavus* and *A. niger* were isolated from the two last-named cases.

GRIGORAKI (L.). **Corps propagateurs et systématiques des dermatophytes du genre Spirallia (Trichophyton microides Sabouraud) ou Sabouraudites Langeron et Ota.** [Reproductive bodies and systematic position of the dermatophytes of the genus *Spirallia* (*Trichophyton microides* Sabouraud) or *Sabouraudites* Langeron and Ota.]—*Comptes rendus Soc. de Biol.*, xcvii, 25, pp. 760–761, 1927.

Species of *Trichophyton* sub-cultured on media containing chalk were found to develop a few fusiform bodies and chlamydospores and a large number of aleuria and spirals. The constancy with which the last-named occur has suggested the classification of these fungi in the genus *Spirallia* [*R.A.M.*, iv, p. 478]. Recent observations of cultures from sycotic hairs showed the production, during the first five days, of a large number of four- to six-septate spindles. These in their turn rapidly produce numerous hyphae with chlamydospores or aleuria. The development of numerous spindles is regarded as an important character which necessitates the inclusion of these dermatophytes in the genus *Closterosporia*. Much affinity is shown with the genus *Microsporon*, not only in the reproductive bodies, but in the powdery aspect of the chalk cultures and in the anatomical and pathological characters of the lesions.

GUYTON (T. L.) & MCCUBBIN (W. A.). **Rose insects and diseases.**—*Bull. Pennsylvania Dept. of Agric.*, x, 5, pp. 1–17, 9 figs., 1927.

Brief, popular notes are given on the following diseases of roses: mildew (*Sphaerotheca pannosa*), black spot or leaf blotch (*Diplocarpon rosae*), rusts (*Phragmidium subcorticium* and *Earlea speciosa* [*P. speciosum*]), brown canker (*Diaporthe umbrina*), crown gall (*Pseudomonas* [*Bacterium*] *tumefaciens*), stem canker (*Leptosphaeria coniothyrium*), and crown canker (*Cylindrocladium scoparium*). Directions are given for the preparation and application of suitable fungicides, together with some general observations on cultivation.

GANTE (T.). **Eine Blattfallkrankheit des Rotdorns.** [A leaf fall disease of Hawthorn.]—*Gartenwelt*, xxxi, 33, p. 505, 1927.

Hawthorn [*Crataegus*] trees near Bonn were defoliated in the summer of 1926 by a species of *Entomosporium* (probably *E. thümenii*), closely related to *E. maculatum* [*Fabraea maculata*], the causal organism of leaf scorch of pears [*R.A.M.*, vii, p. 11]. The life-history and mode of infection of the hawthorn fungus are probably similar to those of *F. maculata* as described by Sorauer and Klebahn, but this has not yet been definitely ascertained. Klebahn's experiments in the transmission of *F. maculata* to hawthorn gave negative results, but it is not yet known whether the *Crataegus* species can infect pears. The hawthorn disease, like

pear scorch, is probably controllable by the removal of infected material and the application of Bordeaux mixture.

WIESE. **Eine Pilzkrankheit an Goldlack und Levkojen.** [A fungous disease of Wallflowers and Stocks.]—*Gartenwelt*, xxxi, 32, p. 486, 1 fig., 1927.

During the spring of 1927 wallflowers [*Cheiranthus cheiri*] and stocks [*Matthiola incana*] in some of the Erfurt [Saxony] nursery-gardens were severely attacked by *Peronospora parasitica*, generally in association with *Albugo candida* [*Cystopus candidus*]. The drooping flowers of affected plants failed to unfold and eventually died. The fungus may be controlled by the eradication of its other hosts, and by spraying with 1 per cent. Bordeaux mixture.

SCHWARZ (M. BEATRICE). **Het hart- en bladrot van Orchideeën, veroorzaakt door Phytophthora omnivora De By.** [The heart and leaf rot of Orchids caused by *Phytophthora omnivora* De By.]—H. van Ingen, Soerabaja, 7 pp., 5 figs., 1927.

Orchids imported into Java from India and the Philippines, as well as endemic species, are stated to be subject to a rotting of the heart and leaves, characterized by a dark discoloration of the affected areas and a drooping appearance of the foliage. The dark, sharply delimited lesions rapidly expand, and in a few days the entire leaf is discoloured and falls. In severe cases infection spreads from the heart to the new leaves formed after the removal of the diseased ones. In milder cases, however, infection may be confined to one of the older leaves, especially if the plants be kept dry. The disease spreads rapidly in frames, affecting not only the highly susceptible *Vanda coerulea* and *V. limbata*, but also the vigorous *Cattleya* and various other genera.

A species of *Phytophthora* which was consistently isolated from diseased orchids, produced the typical symptoms of the rot on the wounded leaves of healthy plants. The strains of the fungus varied considerably in cultural characters and virulence according to their hosts. The strain isolated from *Grammatophyllum scriptum* possessed the smallest sporangia (33 by 25·4 μ on oatmeal agar) and one of those from *Cattleya* the largest (58·4 by 35 and 47·7 by 33·4 μ on oatmeal and Thaxter's agar, respectively). In each case the sporangia were pyriform and with a distinct papilla, while the strains from all species formed oospores and chlamydospores [the dimensions of which are not stated]. All the strains caused a rotting of wounded *Phalaenopsis amabilis* leaves.

The orchid rot is believed to represent a fresh instance of infection by the ubiquitous tropical fungus *P. omnivora*, with which *P. faberi* is regarded as synonymous [*R.A.M.*, v, p. 5].

WEIMER (J. L.). **Observations on some Alfalfa root troubles.**—*U.S. Dept. of Agric. Circ.* 425, 9 pp., 4 pl., 1927.

Among root injuries of lucerne observed by the writer in the eastern and central parts of the United States during 1925–6 [*R.A.M.*, vi, p. 669], 'collar rot', probably identical with the crown injury described by Melchers in 1925 [ibid., v, p. 597], was observed

as far east as New Jersey and as far south as northern Mississippi. The disease, which usually becomes noticeable in spring with the death of single plants up to ten years of age, appears as a firm, moist, brown decay of the outer bark of the collar and of the upper part ($\frac{1}{2}$ to 2 inches) of the taproot. Plants adjacent to those killed may show the disease in a milder form, and, occasionally, the condition is so widespread that re-seeding becomes necessary.

Another disease, 'heart rot', may occur in conjunction with a somewhat similar condition, 'hollow crown', or with collar rot. The first condition is marked by very small, brown spots arranged in circles or scattered throughout the woody part of the root, the whole interior of which may later be destroyed. In severe cases, only a hollow cylinder of living tissue remains, which may, however, permit the plant to continue growth indefinitely. The resistant tissues eventually break apart, giving this part of the root a shredded or honeycombed appearance. The rot may penetrate to the outside in places, or the entire root may be decayed and severed from the top. Sometimes, the injured root is much swollen near the surface of the soil. In 1926, heart rot was observed in eastern Kansas, Oklahoma, north-western Missouri, Wisconsin, and Nebraska.

Cultures made from lesions of collar rot and heart rot revealed that no organism was consistently present, and these conditions are attributed to winter injury.

The condition termed hollow crown is found throughout the United States, resulting from a disintegration of the inner tissues. Plants from 10 to 30 years old were seen whose crowns were entirely hollowed out, but which had sufficient living tissue for continued growth. Nothing definite is known as to the cause of this condition.

Two less common forms of root injury, marked by decay of the taproot and the presence of rough cankers on the roots, respectively, are also briefly described.

Gardner (V. R.), Pettit (R. H.), Bennett (C. W.), & Dutton (W. C.). **Diagnosing orchard ills.**—*Michigan Agric. Exper. Stat. Special Bull.* 164, 70 pp., 8 col. pl., 81 figs., 1927.

This paper contains much useful information on insect pests, fungous diseases, and physiological disorders of apples, pears, peaches, plums, and cherries. The symptoms of each disease are briefly described in simple language, and the concluding section is devoted to suggestions for the avoidance of the various troubles enumerated. A key to the more important disorders of fruit trees in Michigan forms a valuable feature of the bulletin.

Wickens (G. W.) & Carne (W. M.). **Bitter pit in Apples. Its occurrence in store in relation to dates of picking.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., iv, 3, pp. 354–357, 1927.

Experiments carried out with Cleopatra apples showed that bitter pit [see next abstract] did not develop seriously when mature or ripe fruit was picked, and confirmed Smith's contentions [*R.A.M.*, vi, p. 166] that early picking accentuates the disease

in certain varieties, while cold storage soon after gathering retards, but does not arrest, the condition. The disease tends to develop rapidly shortly after picking, and then slows down. The authors' experiments are considered to show definitely that bitter pit can originate in apples after picking. With very susceptible varieties, cold storage may increase the final amount of pit, by prolonging the period of susceptibility.

Carne (W. M.). **A preliminary note on a theory as to the origin of bitter pit in Apples.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., iv, 3, pp. 382–385, 1927.

In the author's opinion, bitter pit of apples is caused by excessive transpiration, and the following explanation is advanced to account for the condition [see also *R.A.M.*, ii, p. 164; vi, p. 166].

Water loss from the surface of a fruit sets up diffusion currents from the inner cells until equilibrium is attained. The osmotic tension of the sugar-containing cells is greater than that of the cells which contain starch, and the latter therefore lose water to their more mature neighbours. Loss of water, if not replaced by the vascular tissue from the tree, must ultimately be borne by the starch-filled cells, and if this loss is great enough, the concentration of the sap in these cells will cause plasmolysis and death. In mature apples, loss of water is distributed through the tissues, and general shrinkage occurs; but in immature apples, the loss is confined to the starch-filled areas, with resultant local shrinkage, death, and pitting, if not replaced.

The author further states that susceptibility to pit lasts from the time when sugar begins to form in the apple until maturity, which is defined as that point of development at which the tissue cells no longer contain starch. Maturity in this sense is not the same as ripeness. Susceptibility is greatest when the fruit is growing rapidly under conditions favourable to excessive transpiration. Varietal differences in susceptibility are explained by the different rates of growth of the various varieties, by the ability of the tree to make up for deficient moisture, and by the fact that susceptible periods occur under different conditions of transpiration and humidity.

Bitter pit in early shipments of susceptible varieties is caused by picking the large terminal apples (those in the centre of the clusters) first, under the mistaken belief that they mature earliest whereas they are really the latest; the frequent presence of the disease on these apples is due to their rapid growth, extensive transpiring surface, late maturity, and consequent picking when immature. The author's observations confirm those of McAlpine that the disease is arrested as maturity is reached, and both his own and other published data are regarded as conclusively establishing the fact that it originates in store as well as on the trees.

These views indicate that the following precautions should be taken in order to avoid bitter pit: the terminal fruits should be removed at thinning time, the largest fruits should be picked last, and picking should be deferred until the fruits approach maturity. After picking, the fruits should be placed in cold storage promptly.

Young (V. H.). **Varietal susceptibility of Ada Red and certain other Apple varieties to cedar rust, with special reference to twig infections.**—*Phytopath.*, xvii, 8, pp. 541–543, 2 figs., 1927.

In the autumn of 1926 cedar rust (*Gymnosporangium juniperi-virginianae*) was observed to cause severe infection of the wood of one-year-old whips [? whip-grafted stock] of the Ada Red apple variety in a number of nurseries in Arkansas, while the twigs of other standard varieties, such as Delicious, Winesap, and Arkansas Black, were not attacked. In practically every case the injury was situated about a foot above the crown and was in the form of a deep-seated canker, which frequently entirely girdled the main stem. In the latter case many of the trees were found to be dead above the point of infection.

It is pointed out that twig infection by this fungus on mature trees of the Ada Red, Jonathan, Benoni, Duchess, and Golden Delicious varieties (the leaves of which, with the possible exception of Benoni, are also extremely susceptible to the rust) is fairly common in north-west Arkansas, but apparently little serious injury results in most cases. Wood infections appear to originate near buds rather than on the internodes, and from the position of the cankers it is inferred that only the apical portion of a growing twig is susceptible to infection.

Osterwalder (A.). **Der amerikanische Stachelbeermeltau und seine Bekämpfung.** [The American Gooseberry mildew and its control.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxvi, 16, pp. 273–276, 3 figs., 1927.

The present paper gives a brief, popular account of the American gooseberry mildew (*Sphaerotheca mors-uvae*) which is stated to be spreading in a threatening manner in Switzerland. The control measures recommended are the immediate removal and destruction by fire of all diseased berries and prunings, liming of the soil during the winter, and washing the bushes during their resting period with a 20 per cent. solution of lime-sulphur. In the spring the bushes should be sprayed with 2½ per cent. lime-sulphur solution immediately after flowering and again a fortnight later.

Wolf (F. A.) & Dodge (B. O.). **Anthracnose of Dewberries and its control.**—*North Carolina Agric. Exper. Stat. Bull.* 248, 16 pp., 6 figs., 1926. [Received November, 1927.]

A description is given in popular terms of the symptoms of anthracnose [*Plectodiscella veneta*] on dewberries [*Rubus* spp.] in North Carolina, together with an account of the life-history of the causal organism and recommendations for its control. In addition to the usual cultural measures, spraying with 4–4–50 Bordeaux mixture should be carried out at three critical periods, namely, (1) during August, (2) as soon as possible after the canes have been tied up in spring, and (3) as soon as the petals have fallen. The estimated cost of this treatment is nearly $10·00 per acre. The so-called 'scabby berry' form of the disease has been found to be favoured by excessive spring rains.

CALDIS (P. D.). **Etiology and transmission of endosepsis (internal rot) of the fruit of the Fig.**—*Hilgardia*, ii, 7, pp. 287–328, 16 pl., 3 figs., 1927.

Under Californian conditions, the severity of attacks of internal rot or endosepsis of caprified figs, caused by *Fusarium moniliforme* [*Gibberella moniliformis*] var. *fici* n. var. [*R.A.M.*, vi, p. 495] depends upon the climatic conditions prevailing from July to September, areas with late, cool summers suffering most, as was well marked in 1925. Rapid ripening of the fruit arrests the growth of the fungus.

More than 250 isolations of the pathogen were made by the author, most being identical, but some varied in habit of growth, size and type of spores, colour of the mycelium and substratum, and type of growth on different media; they also lacked certain of the following structures: sporodochia, sclerotia, pionnotes, and catenulate spores. Certain strains persistently failed to produce the macroconidial type of spore.

An apparently perfect stage of the fungus was once observed. Sixty days after plating, a semicircular row of black perithecia appeared at the point of contact of two colonies of *F. moniliforme fici* originating from fragments of gall flowers. Scattered perithecia, which were black, ostiolate, and gregarious or solitary, were found on the intermixed hyphae and contained greenish, thick-walled, generally uniseptate ascospores, 10·15 by 5·1 μ.

The fungus differs from *F. moniliforme* Sheld. in the minimum measurements of all forms of spores and has shorter micro- and macroconidia. On some media it also shows more aerial and looser mycelium. The aerial mycelium is white, pink, maroon, or reddish-purple, and never approached Isabella colour (Ridgway's Color Standards). Sporodochia are not usually produced on ordinary media, and on steamed corn meal and elder stems either form in columns or else are filiform. Macroconidia do not occur in the aerial mycelium, and most of the strains do not produce sclerotia. Swollen cells in chains or singly are found in the mycelium, but no pionnotes forms were observed.

Adriatic figs while still sterile and attached to the trees were inoculated in duplicate with practically all the isolations of this organism and then protected with paper bags. Infection was found to occur readily, producing the typical symptoms of endosepsis. In every case the organisms were re-isolated from the figs.

The spores of the fungus are introduced by *Blastophaga psenes* into the edible fig at a very early stage, when the fig is ready to be caprified, but the symptoms of the disease do not appear until the fruit is ripe. The organism could be isolated readily from dark red, orange, or brown stigmas, and similar brown areas containing hyphae were found on the stalks and even on the side of the seeds. Following the vascular system, the fungus then invades the other tissues, growing both inter- and intracellularly. No natural source of infection other than caprification was found; in edible figs the life-cycle of the disease is not completed as the blastophaga cannot breed in them. The pathogen completes its life-cycle in the caprifig, paralleling exactly that of its carrier.

A bibliography of nearly fifty titles is appended.

LEE (H. A.) & MARTIN (J. P.). **The development of more effective dust fungicides by adding oxidizing agents to sulphur.**—*Science*, N.S., lxvi, 1703, p. 178, 1927.

In experiments with fungicidal dusts upon the control of eye spot of sugar-cane (*Helminthosporium sacchari*) in Hawaii [*R.A.M.*, vi, p. 753] the authors obtained up to 27 per cent. less infection in plots treated with ordinary dusting sulphur than in untreated controls. Pursuing Young's investigations [ibid., ii, p. 460] they then tested sulphur to which was added 0·25 per cent. nitric acid and 1 per cent. pulverized potassium permanganate. Cane plots so treated showed a reduction of 89·9 per cent. in the infection as compared with the controls, while other plots, treated simultaneously with finely divided sulphur, showed a reduction of only 9 per cent. Increasing the potassium permanganate to 5 per cent. led to a still further reduction in the amount of infection, while even 10 per cent. caused no injury to the cane leaves. When the permanganate was omitted, the reduction in infection in eight similar plots was 61 per cent.

As potassium permanganate in a non-sulphur carrier (such as kaolin) did not reduce the incidence of disease, the authors conclude that the fungicidal effect of the mixture is due not directly to the permanganate, but to its oxidizing effect on the sulphur.

Treatment with oxidized sulphur dusts was followed by an increased growth averaging 8·8 in. per stalk, equivalent to an increased yield of from two-thirds to three-quarters of a ton of sugar per acre.

GINSBURG (J. M.). **Chemical studies of the sulfur-lime dry mix spray in regard to the formation of water soluble arsenic.**—*Journ. Econ. Entom.*, xx, 4, pp. 625–630, 1927.

Spray injury following the use of the New Jersey sulphur lime dry-mix spray [*R.A.M.*, v, p. 311] to which 1 or 1½ lb. of powdered lead arsenate had been added, having been definitely traced to the water-soluble lead arsenate present in the spray, or formed on the leaf, the author conducted a series of experiments [which are fully described] to investigate the reactions involved in the production of the water-soluble arsenic.

Mixtures were prepared, containing an equal quantity of acid lead arsenate but different quantities and concentrations of the other ingredients. They were kept at room temperature for six days, when the amount of water-soluble arsenic present in each was determined.

The results obtained [which are tabulated] showed that sulphur, in the absence of kayso and hydrated lime, did not appreciably influence the decomposition of acid lead arsenate. Large quantities of water-soluble lead arsenic were formed when kayso was added to acid lead arsenate in the absence of hydrated lime and this reaction was found to be due to the calcium carbonate in the kayso, which in solution reacted directly with the lead arsenate to form soluble arsenic salts. An excess of hydrated lime retarded, but did not eliminate, the formation of soluble arsenic, the smallest quantity of which (0·41 per cent.) was found when 6 or 8 lb. of hydrated lime were used in 50 galls. of spray.

Substitution of powdered dried skimmed milk for kayso would make the mixture more stable chemically without reducing its spreading quality.

GUYOT (L.). **Le problème actuel des anticryptogamiques. IV. Les anticryptogamiques colloïdaux.** [The present problem of fungicides. IV. Colloidal fungicides.]—*Journ. d'Agric. Prat.*, xci, 30, pp. 78-80, 1927.

Continuing his previous studies on the problem of fungicides [*R.A.M.*, vi, p. 677], the writer here describes some recent developments in the preparation and application of colloidal substances. In addition to the economy effected by the use of restricted quantities of such preparations as perosan, kurtakol, sulikoll, and sulfarol (all employed against *Plasmopara viticola* on vines), the colloidal fungicides possess the advantages, inherent in their physical structure, of fluidity, homogeneity of distribution, and adhesiveness. Notes are given on recent successful experiments with these preparations, as well as with tillantin B, used against wheat bunt (*Tilletia tritici*). The writer thinks that the great need to-day is the improvement of present technique rather than the invention of new methods of fungicidal treatment.

MANRIN (G.). **Machine à poudrer les semences.** [A seed-dusting apparatus.]—*Journ. d'Agric. Prat.*, xci, 34, pp. 153–154, 1 fig., 1927.

A brief description is given of a simple seed-dusting apparatus manufactured by the Établissements Tourneur frères, Coulommiers (Seine-et-Marne). The seed is placed, with the prescribed quantity of dust, in a polygonal box, fitted with oblique divisions and capable of being rotated; by this method seed is thrown alternately right and left, ensuring thorough admixture with the fungicide. The apparatus is mounted on an axis supported by a framework and set in motion by means of a handle. The box is firmly closed by means of a door which prevents the emergence of the dust. After a certain number of turns, the seed is placed in a sack ready for immediate or subsequent use.

HOLLAND (E. B.) & GILLIGAN (G. M.). **Chemical hydrated lime for the preparation of Bordeaux mixture.**—*Phytopath.*, xvii, 8, pp. 571–572, 1927.

After pointing out the drawbacks presented by the use of ordinary, hand-slaked lime for the preparation of Bordeaux mixtures, the authors state that the chemically hydrated lime which is now extensively produced in the United States is well suited for this purpose. A list is given of nine brands of such lime, samples of which were submitted for trial and gave satisfactory results. They can be recommended as desirable substitutes for the ordinary quicklime.

GOCKEL (A.). **Einiges über Pflanzenfeinde und Pflanzenschutz in den Prärieprovinzen Westkanadas.** [Notes on plant pests and plant control in the prairie provinces of western Canada.]—*Zeitschr. für Pflanzenkrankh.*, xxxvii, 7–8, pp. 208–215, 1927.

The writer describes the present trend of agricultural develop-

ment in the prairie provinces of western Canada (Manitoba, Saskatchewan, and Alberta), referring to the influence of climatic factors and briefly outlining the legislative measures in force against various plant pests, including barberry eradication for the control of stem rust of cereals (*Puccinia graminis*). Statistics are given relating to the losses caused by this disease in various years, with a short survey of the prospects of control by the development and cultivation of resistant varieties of wheat.

RIEDE (W.). **Krankheiten und Vererbung.** [Diseases and heredity.] —*Centralbl. für Bakt.*, Ab. 2, lxxi, 8–14, pp. 272–297, 1927.

In this paper the writer defines the conception of disease as a disturbance of function, and discusses the influence of hereditary and environmental factors on its development in plants. The characters promoting resistance to parasitic and non-parasitic diseases are described, and a section is devoted to plant protection under its dual aspect of plant hygiene (including cultivation and sanitation) and disease control (comprising prophylaxis and therapeutics). The application of the principles defined to the breeding of resistant varieties of plants is critically analysed and a clear view of the problem as a whole presented.

KOCH & ZIEGENSPECK [H.]. **Die Pettenkoferien als Erzeuger des d'Hérelleschen Phänomens.** [*Pettenkoferia*—the cause of d'Hérelle's phenomenon.]—*Centralbl. für Bakt.*, Ab. 2, lxxi, 15–24, pp. 433–435, 1927.

In this paper, which is in the nature of a preliminary communication on their work, a complete report of which, it is stated, will shortly be published in the *Botanisches Archiv*, the authors make a brief reference to the considerable controversy aroused by the recent publication [*Beih. Arch. Schiffs- u. Tropenhyg.*, xxx, pp. 133–143, 1926] of Phil. Kuhn's discovery of a living organism—named by him *Pettenkoferia*—which he claims to have shown to be the cause of d'Hérelle's phenomenon, thus disproving the enzymatic theory of bacteriophagy. In their own experiments, working with spore cultures of *Bacillus subtilis*, *B. mycoides*, and *B. mesentericus*, and using special apparatus [very briefly described], they have been able to confirm all Kuhn's findings. As seen by them the new organism is a very minute, motile body, differing from the bacterial spores in its size and shape. It was observed to penetrate inside the bacteria, where it multiplied: the parasitized bacteria lost their own locomotive power and their contents were gradually destroyed, ultimately leaving only an empty, 'shadow' hull, from which the bodies escaped to resume their activity. These bodies were also seen dividing by constriction inside the bacteria. Occasionally they agglomerate to form considerably larger bodies possessed of a slow amoeboid movement; after some time, these larger bodies contract into globular bodies surrounded by a tough cuticle, which, after a resting pause, divide into diads and tetrads and liberate the smaller bodies which disperse in the substratum and behave as already described. The organism can be cultured for some time in the absence of bacteria, and its whole cycle of development was obtained in cultures of dead bacteria. It cannot

be grown, however, in dead bacteria cultures after thorough sterilization. A sporulation of the bacteria takes place only in the absence of the parasite.

In concluding, the authors state that in their opinion d'Hérelle's phenomenon is enzymatic in its nature, but that the enzymes responsible for it are produced by the parasite.

SCHAFFNIT (E.) & WEBER (H.). **Ueber das Vorkommen von intrazellularen Körpern in den Geweben mosaikkranker Rüben.** [On the occurrence of intracellular bodies in the tissues of mosaic-diseased Beets.]—*Forsch. auf dem Gebiet der Pflanzenkrankh. u. der Immunität im Pflanzenreich*, iv, pp. 23–42, 6 figs., 1927.

Of a number of plants used in the writers' studies on the occurrence of foreign intracellular bodies in the tissues of mosaic individuals, only fodder and sugar beets gave incontestable results [*R.A.M.*, vi, p. 592]. The present paper is therefore limited to a discussion of the phenomena observed in these hosts and in the broad bean (*Vicia faba*), in which somewhat similar conditions were observed.

The technique of the authors' fixing and staining methods is fully described. The best results were given by Zenker's and Flemming's fixation, followed in the former case by Mallory's staining method and in the latter by Heidenhain's iron haematoxylin. Various other methods sometimes gave good results.

Bodies, which the authors term 'elytrosoma', were found within the cells of the phloem strands of the youngest leaves, in the stage before the development of the sieve-plates, in all the diseased beet plants examined, the largest measuring 30 by 5 or 6 μ and the smallest about 1 μ in length. Their shape, like that of a whetstone or a very regular spindle with more or less pointed ends, is so distinctive and well marked that they cannot be confused with coagulations or nuclei, and they were found exclusively in mosaic plants, being absent from the leaves of healthy beets. No sign of structure could be discerned in the bodies found in very young leaves, but very intensive staining revealed an extremely thin 'capsule'-like coating; otherwise the young bodies were completely homogeneous. The bodies occurring in older leaves contained elongated to fusiform, very minute, black structures or granules, the whole mass being surrounded by a distinct capsule. Other bodies of identical shape, visible especially in the older but still not fully expanded leaves, showed clearly differentiated contents, consisting of minute granules which are so compactly arranged in the larger bodies as to be discernible only in the capsular layer, while in the smaller ones they can be perceived as isolated dark globules on a light ground. The bodies in older leaves are sometimes completely empty, only the capsule remaining.

The bodies are always arranged lengthwise in the cell, generally singly but occasionally in pairs. They may occupy any position in the cell but are always surrounded by a layer of protoplasm. No modification in the structure of the cell appears to be caused by their presence.

The progressive development of these bodies, as determined by

sectioning leaves of different ages, consists in the formation of minute, elongated or spherical granules distributed irregularly or in rows, often spirally arranged, in the interior of the originally homogeneous body. Eventually the previously united granular mass disintegrates, the membrane becoming loosened and ruptured and the granules being scattered through the host cells, leaving the empty capsule behind.

The bodies found in *V. faba* resemble those described by Nelson [ibid., ii, p. 277], but in certain details, especially as regards the absence of flagella and basal granules, the present observations are more in agreement with those of Doolittle and McKinney [ibid., ii, p. 514]. In shape the bodies are more variable than those of the beet. At first a very slender shape prevails but subsequently much swollen, lemon-shaped, and spherical bodies were found. The double forms described by Nelson, and giving the impression of division stages, were also observed. The bodies of *V. faba* are smaller than those occurring in beet, the largest measuring 10 by 5 μ and the smallest 3 to 5 by 1 to 2 μ. Generally there is only one in a cell, surrounded by granular protoplasm which sometimes extends to the walls and may simulate the flagella of Nelson. The bodies are often, but not always, near the nucleus.

The comparative features of the intracellular bodies found by the authors and those described by other workers are discussed at some length, especially their resemblance to those discovered by Petri in the leaf roll (arricciamento) of the vine [ibid., iii, p. 251]. They are regarded as being definitely connected with the mosaic disease and it is suggested that, if they are the cause of the latter, transmission by aphids is due to the ingestion, not of the larger bodies, but of their granular contents after the latter have been liberated. Recent experiments have indicated that mosaic can be caused by inoculating healthy beets with the juice of crushed aphids that have fed on diseased plants, and preliminary studies have revealed the presence in the alimentary canal of such aphids of bacillary bodies in the cells, which stain intensely with iron haematoxylin.

HORNE (A. S.) & MITTER (J. H.). **Studies in the genus Fusarium. V. Factors determining septation and other features in the section discolor.**—*Ann. of Botany*, xli, 163, pp. 519–547, 27 graphs, 1927.

The scope of this investigation [full details of which are given] was to determine whether the same relations would obtain between cultural conditions and the spore characters of the species of the *discolor* group of *Fusarium* already studied by the authors in respect of their rotting action on apples [*R.A.M.*, vi, p. 623] as those that were established by Brown and Horne in the case of the species studied by them [*F. blackmani*: ibid., v, p. 388; vi, p. 734].

When grown at standard concentration of the medium, all the strains tested, with the exception of *F. polymorphum*, proved to be of the non-staling type; their septation mode in 10 to 13 days old cultures varied from 1 for *F. lolii* to 5 for *F. culmorum*, with corresponding variations in the average septation from about 1·7 to 4·9.

The strains of *F. polymorphum* showed a slight retardation in radial spread in successive periods, and their septation mode varied from 3 to 5. When the composition of the culture medium was subjected to a sufficiently wide range of variations in any one of the following factors, namely, concentration of the substratum, concentration of the nitrogenous constituent, or hydrogen-ion concentration, the curve obtained for the average septation in any one series was of the 'optimum' type with gradients from the summit in the direction of low and high concentration. The curve for each strain differed from the others in its shape and gradient, and also in the position of its summit relatively to the scale of concentrations. In some strains the curve was abruptly truncated at or near the summit, owing to the cessation of spore production.

Increasing concentration of the glucose constituent reduced either the sporing capacity of the strains, or their average septation, or both, the other features associated with it being: a tendency for the radial spread of the fungi to diminish; degenerative changes in the spores, e.g., atrophy, fragmentation, and the like; loss by the spores of their vacuolate appearance, their contents becoming more and more granular; and colour production within a narrow range of concentration (from 8 to 10 times the initial concentration).

In media where the acidity and alkalinity were varied, the rate of radial spread reached a maximum in the region of neutrality. As such media become alkaline or increase in alkalinity with time owing to the action of the fungi, it is inferred that the changes in colour, septation, and the like, which were observed, bear no direct relation to the initial concentration of acid and alkali employed, but show a close correspondence with the changes observed in series where the nitrogenous constituent (asparagin) was varied.

PFISTER (R.). **Zur Biologie von Cystopus tragopogonis Pers.** [On the biology of *Cystopus tragopogonis* Pers.]—*Centralbl. für Bakt.*, Ab. 2, lxxi, 8–14, pp. 312–313, 1927.

Inoculation experiments with *Cystopus tragopogonis*, carried out during 1922–6, revealed the existence of extensive specialization in the fungus, at least seven different biologic forms of which are enumerated.

FOLSOM (D.). **Virus diseases of the Potato.**—*Seventeenth Ann. Rept. Quebec Soc. Prot. Plants, 1925–1926*, pp. 14–29, 9 pl., 1927.

In this paper the writer describes the symptoms of the virus diseases of potatoes, which may be classified in five groups according to their appearance in the Green Mountain variety, namely, leaf roll (with which is included yellow top), mosaic (mild, rugose, and leaf roll mosaic, crinkle, and the unnamed type V), aucuba, streak, and spindle tuber (with which is included unmottled curly dwarf and giant hill). The subject is discussed under various aspects, including nomenclature, etiology, the influence of climatic and edaphic factors, geographic distribution and prevalence, and control. Tables are given showing the differential characteristics of eleven virus diseases of Green Mountains in north-eastern Maine.

GILBERT (A. H.). **Net necrosis of the Potato.**—*Phytopath.*, xvii, 8, pp. 555–561, 4 figs., 1927.

The author points out the confusion which appears to exist in the terminology of potato tuber necroses, and of which a good example is to be found in Atanasoff's recent papers [*R.A.M.*, vi, pp. 115, 311] describing under the term 'net necrosis' a condition of potato tubers and aerial parts in Holland quite distinct from the condition known under that designation in the United States. The accepted significance of the term in the United States, as follows from the review of the existing literature and of his own studies [details of which are given], applies to the browning and dying of the phloem tissues of the tuber, both outside and inside the cambium, which is associated with leaf roll. It has been definitely shown that necrotic tubers of this type consistently produce plants affected with leaf roll, and that net necrosis does not persist in the progeny of such plants but is believed to be a result of initial infection. Although the production of spindling sprouts is not a constant symptom of leaf roll, it is quite consistently associated with net necrosis. Tubers seriously affected with the latter disease invariably give rise to spindling sprouts either from a part or from all of the eyes; occasionally normal sprouts may arise from the bud end eyes of such tubers, but all plants thus produced present symptoms of leaf roll.

The author believes that if the correlation between the tuber necrosis as described by Atanasoff and aucuba mosaic is substantiated, this will apparently be a second type of tuber necrosis of an infectious nature, the other being the above-mentioned phloem necrosis associated with leaf roll.

MARCHAL (E.). **Belgium: first notification of the existence of 'wart disease' of the Potato.**—*Internat. Bull. of Plant Protect.*, i, 7, p. 105, 1927.

Two centres of wart disease of potato (*Synchytrium endobioticum*) have been discovered almost simultaneously, one at Courlecles (Hainhault) and the other at Stavelot (Liège). In both places the disease is confined to certain groups of allotments in which the same plot is repeatedly used for potatoes. The situation is in the hands of the Belgian Ministry of Agriculture.

KÖHLER (E.). **Fortgeführte Untersuchungen über den Kartoffelkrebs. III.** [Continued investigations on wart disease of Potatoes. III.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xv, 3, pp. 401–416, 1 pl., 1927.

In continuation of his previous investigations on varietal reaction to wart disease of potatoes [*Synchytrium endobioticum*: *R.A.M.*, vi, p. 502], the writer tested by Spieckermann's inoculation process [ibid., vi, p. 369] the behaviour of two selections (Dutch and German) of Roode Star, a variety officially designated as immune in Germany and England, and as susceptible in Alsace and Holland. Both the German and the Dutch selections, which were supplied by Heine (Hadmersleben) and Veenhuizen, respectively, slowly developed minute excrescences and the variety must therefore be termed very slightly susceptible.

It was further shown by another inoculation experiment [details of which are given] that the development of the sori up to the migration stage (immediately preceding sporangial formation) proceeds as rapidly on Roode Star as on the susceptible Industrie variety. The number of infections was also found to be approximately equal on both varieties. The extremely slow development of the excrescences on Roode Star is attributed to the very slight reaction induced in this variety by the chemical stimuli proceeding from the parasite. The inoculum employed in these tests with satisfactory results was a wart compost collected in the autumn of 1925, used in the spring of 1926 for a similar experiment, and then kept in a dry place till February, 1927. Under favourable environmental conditions the germination of the resting sporangia took place chiefly in the fourth to the sixth week from the beginning of the test.

When the shoot axis is infected only on one side, longitudinal growth is arrested over the affected area, so that the shoot inclines in the direction of the attack. In the case of rapidly growing, etiolated shoots, a deep transverse fissure develops on the infected side but the shoots are not bent over. Infected leaves form storage tissue in which the excess of starch is deposited. This process is favoured by darkness.

In conclusion the results of the writer's previous and current investigations are concisely summarized.

Prüfung von Kartoffeln auf Widerstandsfähigkeit gegen Kartoffelkrebs durch den deutschen Pflanzenschutzdienst. [Testing of Potatoes for resistance to wart disease by the German Plant Protection Service.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 8, pp. 79–80, 1927.

Particulars are given of the regulations governing the official tests of potatoes for immunity from wart disease [*Synchytrium endobioticum*]. The preliminary trials take place at the Biologische Reichsanstalt or one of the plant protection headquarters at Münster or Lübeck, generally during the winter, and only the varieties approved on these occasions are eligible for the main laboratory and field tests, which are conducted simultaneously at the three above-mentioned places.

APPEL (G. O.). **Beitrag zur Frage der Immunitätszüchtung der Kartoffel.** [Contribution to the question of breeding for immunity in Potatoes.]—*Pflanzenbau*, iv, 4, pp. 51–56, 1927.

In this paper the writer discusses in general terms the problem of developing potato varieties immune from blight (*Phytophthora infestans*). The work of previous and contemporary investigators in this connexion is summarized, reference being made, *inter alia*, to recent papers by Miss Löhnis [*R.A.M.*, iv, p. 761] and others, and to K. O. Müller's important recent investigations at the Biologische Reichsanstalt. These last are considered to have provided the basis of future work along similar lines, since they have resulted in the development of two quasi-immune strains, one from a cross between a semi-cultivated variety of *Solanum tuberosum* and Dolkowski's

Switez, and the other by selfing a wild South American strain of unknown origin.

Mielck (O.). **Beobachtungen über die Krautfäule der Kartoffel im Jahre 1926.** [Observations on late blight of the Potato in the year 1926.]—*Mitt. Deutsch. Landw. Gesellsch.*, xlii, 6, p. 153, 1927.

Referring to Müller's investigations on varietal reaction to potato blight (*Phytophthora infestans*) [*R.A.M.*, v, p. 688], which was exceptionally severe in Germany in 1926, the writer cites data indicating that the age of the plants is the primary factor in the development of infection. The common observation that late varieties enjoy a high degree of resistance to blight, while early ones are uniformly susceptible, is explained by the fact that the fungus can thrive only on foliage which has reached a certain stage of maturity [ibid., v, p. 180]. Therefore any factor tending to retard development, such as late planting, is likewise calculated to delay the appearance of blight. In one case it was noticed that the Pepo, Gratiola, Industrie, and Parnassia varieties showed heavier infection following oats than after rye, a result which the author suggests may be due to the influence of the preceding crop on the development of the potato, and consequently on its liability to infection.

Musser (A. M.). **Experiments with certified Irish Cobbler Potatoes.**—*South Carolina Agric. Exper. Stat. Bull.* 232, 20 pp., 1 fig., 3 diags., 1926. [Received November, 1927.]

In consignments of certified Irish Cobbler seed-potatoes imported into South Carolina over a period of five years, *Rhizoctonia* [*Corticium*] *solani* was the only disease with an average incidence of over 3 per cent., that of mosaic, leaf roll, blackleg [*Bacillus atrosepticus*], and scab [*Actinomyces scabies*] being below this figure. Tubers from Wisconsin and Vermont gave the highest average yield in five years' tests at three stations, while those from Michigan occupied the first place in a four years' series.

Hadfield (J. W.). **Government certification of seed Potatoes. System to be initiated in Canterbury.**—*New Zealand Journ. of Agric.*, xxxv, 2, pp. 102–106, 1927.

To ensure a supply of seed potatoes true to name and free from disease a system of seed certification has been introduced in the District of Canterbury and may later be extended over the whole of New Zealand. Any grower planting one acre or more of any of nineteen varieties [which are named] may apply for certification, forwarding at the same time a sample of 100 tubers for comparative trial with all other samples submitted.

Three inspections of the farmers' crop will be made, the first in January, the second just before the tops mature, and the third when harvested and graded.

Certificates will be issued for crops reaching the requisite standard [not specified, but to be settled in January of each year] and the grower will be required to keep a record of sales covered by each certificate.

MONTEMARTINI (L.). **Brevi note sopra la cicatrizzazione dei tuberi di Patata (Solanum tuberosum L.).** [Notes on cicatrization of Potato tubers (*Solanum tuberosum* L.).]—*Ann. di Botanica*, xvii, 4, pp. 195–201, 1 fig., 1927.

Experiments [which are described] showed that in halves of potato tubers exposed to the light in a moist atmosphere [*R.A.M.*, ii, p. 384] cell division occurred at least one day later than when similarly cut tubers were left in the dark. In a number of young tubers which had been cut in half, the halves tied together, and kept in the dark, cell division near the cut was general after 22 days, whereas in tubers similarly treated, but kept in the light, it had scarcely begun.

Halves of tubers were washed with 0·005 per cent. copper acetate, others with 0·005 per cent. copper sulphate, and others again with 0·01 per cent. ethyl alcohol. One half of each tuber was washed in water only, as a control. The halves were then placed in the dark in a moist atmosphere. In all the chemically treated cases, differentiation of the phellogen and cell division took place more rapidly than in the controls, differentiation occurring, in the treated tubers, in the second or third, seldom in the fourth, layer of cells under the exposed surface, while in the controls, it took place in the third, fourth, or fifth layer. The author suggests that these substances may make the protoplasm more sensitive to all stimuli, including wound stimuli.

In further experiments [which are fully described] made to investigate the influence exercised on cicatrization by the 'eyes' in a given portion of tuber, differentiation and cell division of the phellogen occurred from one to two days earlier in halves of tubers from which the eyes had been removed than in those in which they were left. The author concludes from this that the eyes retard and diminish the reactive power of the cells near them, and that this retardation is not chemical, as it does not extend from one half to the other of a cut tuber, even when perfect contact is established; in uncut tubers it is restricted to the areas at only a moderate distance from the eye. A tuber from which some of the eyes had been removed was cut into three sections, so that only one part still contained them; the parts were tied together and placed in the dark, in a moist atmosphere. After eight days, cicatrization was apparent on all cut surfaces except on that of the section containing the eyes. Eight days after all the eyes except those at one end had been removed from another tuber, which had then been halved longitudinally, tied exactly together, and placed in a dark, moist atmosphere, the cells of the phellogen at the end remote from the eyes each showed from five to six divisions, whereas only one or two, rarely three, cell divisions were seen near the eyes.

[STAHEL, G.]. **The South American Hevea leaf disease in Surinam.**—*India Rubber World*, lxxvi, 5, pp. 251–252, 10 figs., 1927.

A brief account is given of the ravages caused by the South American leaf disease (*Melanopsammopsis ulei*) in the *Hevea* rubber plantations of Dutch Guiana [*R.A.M.*, iv, p. 309]. From 1915 onwards infection was so heavy that the branches and trunks of five- to eight-year-old trees were destroyed, while occasionally the

whole tree succumbed down to the roots. This condition, coupled with a considerable fall in the price of rubber, led to the gradual abandonment of the *Hevea* trees in mixed coffee and rubber plantations and to the replacement of the former by *Erythrina glauca*, a more suitable shade tree for coffee. The production of rubber in unmixed plantations sank to nil during 1920 to 1925, but in 1926 a few planters, encouraged by the exceptionally high rubber prices of that year, obtained a yield of 6 tons from 8,000 to 10,000 trees.

Observations have shown that the South American leaf disease is most serious in the interior of the country, where the rainfall is very much heavier than near the coast (average for the past five years, about 83 inches at Kabelstation, 130 km. from the sea, compared with about 58 at Coronie, 3 km. from the coast). The conidia of *M. ulei* require the presence of moisture on the leaves for 10 to 12 hours in order to effect penetration of the tissues, and therefore plantations situated in the comparatively dry and breezy areas near the coast are much less liable to infection than those further inland. Similar conditions are stated to prevail in British Guiana, where all the rubber plantations except those near the coast have been destroyed by leaf disease. It is suggested that experiments should be carried out in plots containing 5,000 to 10,000 closely grown trees to ascertain the future possibilities of rubber cultivation in Dutch Guiana.

Skinner (C. E.). **The effect of protozoa and fungi on certain biochemical processes when inoculated into partially sterilized soil.**—*Soil Science*, xxiv, 3, pp. 149–161, 1927.

The author describes in detail experiments to determine the influence of protozoa and fungi on soil activities when reinoculated into soil partially sterilized so as to eliminate these organisms. A definite number of one species each of protozoa and bacteria were added to the soil, which was then contrasted with soil reinoculated with an equal number of the same bacterial species, free from protozoa, with the same reinoculated with a suspension of spores of *Trichoderma koningi* and a species of *Penicillium*, and with the same reinoculated with a fresh soil infusion. Controls included both untreated soil and partially sterilized soil inoculated with sterile soil infusion. The moisture of the soil infusion was approximately three-fourths saturation, full saturation being 37·2 per cent. on the dry soil basis.

The results [presented in tabular form] showed that the protozoa reduced the number of bacteria and slightly depressed the evolution of CO_2 and the accumulation of NH_3; the fungus inoculum increased the evolution of CO_2 and decreased the accumulation of NH_3.

The author does not admit that the suppression of the protozoa is the sole, or the most important, factor responsible for partial sterilization phenomena. His results show an action on the part of the fungi at least as marked as that of the protozoa. The depression of NH_3 accumulation was greater in flasks inoculated with fungi than in those inoculated with protozoa, and the stimulation of CO_2 evolution by fungi was greater than the depression caused by protozoa. He considers that Waksman and Starkey [*R.A.M.*,

iii, p. 175] correctly attributed at least as much importance to the fungi as to the protozoa in this connexion. In his opinion, Matthew's theory [ibid., iii, p. 552], that the increase in the numbers of bacteria in soils partially sterilized by antiseptics is due to an increased food supply from the antiseptics themselves, is untenable, as it is a known fact that when non-nitrogenous materials are added to soil or to an artificial medium, the microbial population which develops must obtain its nitrogen from other compounds of the soil or culture medium, and this may lead to a reduction in available nitrogen. The author suggests that most of the increased fertility in partially sterilized soils results from the killing of the large soil population of living cells, making them available for nutritional purposes after decomposition.

The literature of the subject is briefly reviewed, and a bibliography of 43 titles is appended.

German Hop report.—*Journ. Inst. of Brewing*, N.S., xxiv, 8, p. 412, 1927.

The hop report for 1926–7, recently issued by Barth & Sons, Nuremberg, is stated to contain much valuable information on the cultivation, production, and parasites of this crop on the Continent, in America, and in Great Britain. Throughout Europe considerable damage has been done by downy mildew (*Pseudoperonospora humuli*) [*R.A.M.*, vi, p. 751], while mosaic was prevalent in Jugo-Slavia, and the French crop was badly infected by mildew [*Sphaerotheca humuli*]. The supposed immunity from mildew of the Saaz and Auscha varieties was not maintained during the past year. In many cases the postponement of spraying was largely responsible for the ruin of the crops. In the Hallertau district first-class hops were obtained only by growers who had sprayed their gardens fifteen times or more. The Belgian crop was heavily reduced by the attacks of red mould (*Fusarium*) and *P. humuli*. The latter fungus is stated to be in evidence on all the 1927 crops.

Korff & Zattler. **Dringender Aufruf zur Hopfenbespritzung.** [Urgent appeal for the spraying of Hops.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, v, 5, pp. 122–123, 1927.

On the nights of the 20th and 21st July, 1927, the temperature [at Munich] fell to 6·5° C., involving arrested growth and weakening of the hops, accompanied by increased susceptibility to downy mildew (*Peronospora*) [*Pseudoperonospora humuli*]. An urgent appeal was therefore issued for the protection of this crop by the immediate application of 0·5 per cent. Bordeaux mixture [*R.A.M.*, vi, p. 317].

Downy mildew of the Hop: warning as to spraying.—*Journ. Min. Agric.*, xxxiv, 5, pp. 481–482, 1927.

Although downy mildew of the hop [*Pseudoperonospora humuli*] would appear to be amenable to control with Bordeaux mixtures, and the practice has indeed been recommended in some instances on the Continent [see preceding abstract], growers are warned against spraying the hop cones with such mixtures, as the copper contained in them, if they reached the cones, would render the latter entirely

unsuitable for brewing purposes [but see *R.A.M.*, vi, p. 693, and next abstract]. Under present conditions it is deemed more prudent to abstain entirely from spraying hops with these mixtures, and to adopt the control measures recommended by Salmon and Ware [ibid., vi, p. 316].

WIEGMANN (D.). **The brewing value of Hops attacked by Pseudoperonospora.**—*Journ. Inst. of Brewing*, N.S., xxiv, 7, pp. 401–402, 1927.

In this paper, which originally appeared in the *Zeitschrift für das gesamte Brauwesen*, p. 73, 1927, the writer describes the results of his examination, from the brewing standpoint, of eight different hops which had been sprayed with Bordeaux mixture for the control of downy mildew (*Pseudoperonospora*) [*humuli*]. The samples were tested for bitter substances, ash, and copper, the content of which was found to be 12 to 14·4, 6·5 to 8·3, and 0·004 to 0·032 per cent., respectively. The aroma was not at all impaired, although a number of infected cones were present. Small-scale brews were carried out with four of the samples and the resultant beers were found to be satisfactory, with no trace of a metallic flavour, such as is imparted by the addition of 0·002 per cent. copper sulphate to the finished beverage.

SALMON (E. S.). **On forms of the Hop resistant to mildew (Sphaerotheca humuli (DC.) Burr.); VI. Temporary loss of immunity.** —*Ann. of App. Biol.*, xiv, 3, pp. 263–275, 1927.

In continuation of his studies on the resistance of varieties of the hop to mildew (*Sphaerotheca humuli*) [*R.A.M.*, i, p. 199] the author describes in detail a temporary breakdown in the early spring of 1926 in the resistance of three varieties, namely, Golden Hop, seedling hop X 91, and seedling hop 310, all of which had hitherto consistently shown complete immunity from the disease both under glass and in the field. In every case the infection was limited to a few small patches bearing conidiophores of the fungus on a very few leaves, and it did not show any signs of extension although the plants were left fully exposed to further infection. The patches progressively died away, until in May and June all the infected plants had apparently recovered their full power of resistance.

With a view to establishing whether this outbreak of the disease was due to the evolution of a new specialized form of *S. humuli*, capable of attacking resistant varieties of the hop, conidia from the above plants were used in inoculation experiments both on their own hosts and on other resistant or susceptible varieties. The results [described in detail] did not, however, support this hypothesis, since these conidia were found to be unable to infect the plant on which they had been produced or any other resistant variety, while retaining their full pathogenicity towards susceptible varieties. The balance of evidence tends rather to indicate that the resistance of the immune varieties had suffered a temporary breakdown, probably owing to the abnormal weather conditions (possibly low temperature) which prevailed during the period in question.

SALMON (E. S.) & WARE (W. M.). **Grafting experiments with varieties of Hops resistant to the hop powdery mildew, Sphaerotheca humuli (DC.) Burr.**—*Ann. of Appl. Biol.*, xiv, 3, pp. 276–289, 1 pl., 1927.

In an attempt to test whether the varietal resistance of hops to powdery mildew (*Sphaerotheca humuli*) was affected by grafting, twenty composite plants were built up in 1926 either by grafting a scion of an immune variety of hop on a susceptible stock or vice versa. Experiments in which the young leaves of such plants were inoculated with conidia of the fungus after the lapse of a considerable time since the grafting, showed that no change had been effected by this operation in the respective reaction of the immune or susceptible varieties to *S. humuli*. It is therefore thought improbable that immunity from or susceptibility to this organism is connected with any transferable substance in the hop plant.

FARIS (J. A.). **Field control of Sugar cane root disease conditions.**—*Trop. Plant Res. Foundation Bull.* 6, 16 pp., 1 graph, 1927.

Soil conditions are important factors in the production of root diseases of sugar-cane in Cuba, where field and pot experiments conducted during two years failed, except in the case of zonate foot rot, to demonstrate the primary parasitism of any fungus isolated from diseased cane or from seed-pieces over which chopped, diseased roots had been spread at planting [*R.A.M.*, vi, pp. 508, 509].

Practical directions are given for reducing the injury due to inadequate drainage in waterlogged soils and for conserving soil moisture during the dry season in certain porous soils and also in heavy clays.

Sea salt is the most important soil constituent deleterious to sugar-cane in Cuba, and where its presence exceeds 0·15 per cent. cane should not be planted. Under-drainage, relatively close planting, and the maintenance of a surface mulch are sometimes effective in reducing the amount of salt in the surface layers. The juice from the cane on lands low in salt exceeds that from areas of high salt content in purity by 6·7 per cent. and in degrees of polarization by 12.

Root limitation due to infertile soil is largely confined in Cuba to the porous red Matanzas clay soils, and as these generally respond to fertilizers containing a high percentage of phosphoric acid, soil moisture is probably a chief limiting factor, the phosphoric acid indirectly correcting this by increasing the root system.

Weed competition is considered to be one of the chief causes of cane root failure, and directions are given for controlling or eradicating some of the worst of the weeds, e. g., Johnson grass [*Andropogon halepensis*].

FARIS (J. A.). **Use of poor seed Cane in Cuba.**—*Facts about Sugar*, xxii, 35, p. 845, 1927.

In connexion with a special investigation, on behalf of the Cuba Sugar Club, on the cause of the extensive premature dying-off of

newly planted seed-cane, the writer states that in many cases the condition is due to the use of defective seed. On digging up the canes with pithy or water-soaked stalks it was found that the centres of the seed-pieces had rotted away, thus severing the connexion between the roots of the mother seed-piece and the new shoots and preventing the passage of nutriment from the roots to the aerial parts. The stalk diseases responsible for the rapid deterioration of standing carried-over cane are stated to be almost exclusively due to organisms attacking the weakened tissues of over-ripe cane. Such conditions are likely to be very prevalent during the current season owing to the protracted drought.

EDWARDS (W. H.). **Une cause de non-réussite lors de la plantation des Cannes à sucre. La destruction des boutures par le champignon pathogène Thielaviopsis paradoxa.** [A cause of failure in Sugar-cane plantations. The destruction of the cuttings by the pathogenic fungus *Thielaviopsis paradoxa*.] —*Rev. Agric. de l'Ile Maurice, 1927*, 34, pp. 228–229, 1927.

Young sugar-cane plantations in Mauritius are stated to be very subject to infection by *Thielaviopsis paradoxa*, which is present in the soil and penetrates the cuttings through wounds. In severe cases the eyes are destroyed before they begin to shoot, and even in milder types of infection development is retarded. In an experiment carried out at Réduit, the treatment of the cuttings with Burgundy mixture reduced the incidence of pre- and post-germinative mortality by 46 and 58·3 per cent., respectively. Directions are given for the preparation of this solution and also of Bordeaux mixture, which may be applied for the same purpose.

FAWCETT (G. L.). **Las manchas blancas de las hojas de la Caña.** [Cold chlorosis of Sugar-cane.]—*Rev. Indus. y Agric. Tucumán*, xvii, 11–12, pp. 259–261, 1 fig., 1927.

Further observations are made in connexion with cold chlorosis of sugar-cane [*R.A.M.*, vi, p. 602], which was found to develop within a few days in plants exposed to temperatures between 0° and 5·5° C. for two to six hours. The condition, which is stated to be of no economic importance, was first observed in Tucumán in 1925.

BRITON-JONES (H. R.). **Mycological note. Rhizoctonia bataticola (Taub.) Butler.**—*Trop. Agriculture*, iv, 8, pp. 147–148, 1927.

In discussing Small's recent work on *Rhizoctonia bataticola* [*R.A.M.*, vi, p. 742; vii, p. 62], the author states that his experiments with this fungus on cotton in Egypt and Trinidad [ibid., v, p. 20; vi, p. 666] indicate that it requires special conditions to induce it to cause root rot, and that Small's statement that root disease will always occur when *R. bataticola* is present in the soil cannot be accepted. At the same time, he considers it likely that the view that this parasite is the real cause of diseases hitherto attributed to fungi such as *Fomes lignosus* is correct. In Trinidad, *F. lignosus* is common on stumps in cacao plantations, but it has never been recorded as causing root disease in that island.

An attempt to produce the pycnidial stage of *R. bataticola* [*Macrophomina phaseoli*: ibid., vi, p. 757] was made with cultures of this fungus isolated from sclerotia in the cortex of a lime root in Ceylon, from a sweet potato sent to England by Taubenhaus as a typical case of charcoal rot [caused by his *Sclerotium bataticola*], and from cotton in Trinidad. All these produced the pycnidial stage when inoculated into wounded living jute stems, and cultures from the pycnospores thus obtained again yielded the *Rhizoctonia* form. A similar culture from a single pycnospore from a pycnidium on bean stems received in England from South Carolina [as *Macrophoma phaseoli*: ibid., vi, p. 138] also gave the same result, the *Rhizoctonia* form being again obtained from the pycnidia developed on the inoculated jute.

Attempts to infect cotton with *R. bataticola* isolated from this host in Trinidad have hitherto failed.

NAKATA (K.). **Studies on Sclerotium rolfsii Sacc. Part IV. The size and shape of the sclerotia and their relation to the kinds of the fungus.**—*Bulteno Sci. Fakultato Terkultura, Kjuŝu Imperia Universitato*, ii, 3, pp. 169–189, 1927. [Japanese, with English summary.]

Continuing his studies on *Sclerotium rolfsii* [*R.A.M.*, vi, pp. 55, 56], the author made an investigation of the effects of environmental conditions on the sclerotia. The size and shape of these bodies were found to be greatly modified by the chemical composition, concentration, and hydrogen-ion reaction of the culture media, as well as by the temperature maintained during incubation. The sclerotia developed best at 32° C. on media containing an abundance of nutriment, e. g., standard koji extract agar, and having a reaction of about P_H 5·4. Under generally unfavourable conditions the sclerotia assume a spherical shape and only attain small dimensions (0·9 mm. in diameter). These effects were observed in 49 cultures from different localities and were most marked in strains normally characterized by large or irregular sclerotia. It was found that the strains of *S. rolfsii* from the Philippines and the West Indies form sclerotia measuring 1 mm. in diameter, those from the United States 1 or 3 mm., from Japan, Formosa, and Korea 2 or 3 mm., and from South America 3 mm.

NAKATA (K.). **Studies on Sclerotium rolfsii Sacc. Part V. Physiological characters in relation to the strains of the fungus.**—*Bulteno Sci. Fakultato Terkultura, Kjuŝu Imperia Universitato*, ii, 4, pp. 237–252, 1927. [Japanese, with English summary.]

In a series of experiments with pure cultures of 49 strains of *Sclerotium rolfsii* [see preceding abstract], the characters of colour, surface growth, topography, structure, layer of mycelium, and distribution of sclerotia remained constant under identical conditions. The fungus tolerates acid and alkali, and produces a considerable amount of acid in the course of growth [*R.A.M.*, vii, p. 48]. The different strains of *S. rolfsii* vary in their toleration of acid and the amount produced, but not in the temperature at which they grow. Experimental evidence showed that pathogenicity is a dis-

tinguishing character of the strains. Cultural features are stated to form the best basis for the differentiation of biologic forms of *S. rolfsii*, especially when koji extract agar is used as a culture medium.

NAKATA (K.). **Studies on Sclerotium rolfsii Sacc. Part VI. Two mutants in the fungus.**—*Bulteno Sci. Fakultato Terkultura, Kjušu Imperia Universitato*, ii, 4, pp. 291–307, 1 pl., 2 figs., 1 diag., 1927. [Japanese, with English summary.]

In the present paper the writer describes the occurrence of two mutants of *Sclerotium rolfsii* (M 1 and M 2) obtained from two different cultures in March and July, 1925 [see preceding abstracts]. The hyphae of M 1 are brown and slender, making a cottony surface growth, and measuring 5 μ in width. The outer part of the extremely large and irregular, blister-like sclerotia consists of three or four layers, measuring 33 μ in thickness. This form shows one-sided aversion [*R.A.M.*, vi, p. 55] to the strain from which it was isolated and mutual aversion to other strains of the fungus. Loss of pathogenicity and production of *Hypochnus* [*Corticium centrifugum*: ibid., vi, p. 56] spores in culture media are marked characteristics of M 1. M 2 agrees in all respects with the original strain, except for the occurrence of mutual aversion between the two.

M 1 and M 2 bred true during repeated subsequent transfers. They were grown on different kinds of media and under various conditions without losing their constant morphological and cultural characters.

The term 'saltant' or 'transmutant' is preferred to 'mutant' in all cases amongst fungi in which it applies to phenotypes arising from segregation or hybridization. In the case of *S. rolfsii* fusion occurs between mycelia of the same strain only, and a binucleate cell is formed. Different strains exhibit mutual aversion, leaving a space between the colonies in which no mycelial growth occurs. Thus the new forms M 1 and M 2 are regarded as true mutants caused by genotypic change and not by segregation or hybridization, and are comparable to bud variation in higher plants.

NAKATA (K.). **The Tobacco wilt with special reference to the cause of the disease.**—*Journ. Sci. Agric. Soc.* (*Tokyo*), 294, pp. 185–216, 1927. [Japanese, with English summary.]

Using 160 samples of diseased material from Japan, Korea, and the United States, the writer carried out a series of investigations to determine the causal organism of tobacco wilt, which is distinct from hollow stalk [*R.A.M.*, iv, p. 317]. The latter disease was shown to be due to *Bacillus aroideae* [ibid., iv, p. 196]. Wilting was found to be due to the action of a toxic substance secreted by the causal organism, while blackening of the plant is due to the action of tyrosinase on the tyrosin resulting from the decomposition of albumin. The degree of discoloration and the time required for blackening were found to vary with the amounts of sugar and albumin in the media, and also with the vitality of the organism. Generally speaking, the production of the black discoloration was inhibited by the presence of sugar and by a high degree of vitality in the organism.

The disease is shown to be caused by a *Bacterium* with the index number 222.222.3832. One form of the organism develops irregular, fluid, iridescent, tar-black colonies in agar cultures and slightly liquefies gelatine; while the other produces circular, homogeneous, opalescent, dirty whitish or brownish colonies on agar without liquefaction of gelatine. Acid is produced and casein coagulated in milk cultures containing fat, while alkali is formed in the absence of fat. Good growth is made in Cohn's solution when a relatively large amount of inoculum is transferred. The reaction of the organism towards acid and temperature varies according to the kind of medium used.

These characters agree with those of the original culture of *Bact. solanacearum*, with which the causal organism of tobacco wilt in Japan is considered to be identical. *Bact. nicotianae*, the name proposed by Uyeda (*Imp. Centr. Agric. Exper. Stat. Bull.*, i, p. 39, 1905) for the causal organism of the disease, was not obtained by the present writer in numerous isolations, even from material collected in the original locality. Contamination with *B. aroideae* is suspected to have occurred in Uyeda's material. The characters of *Bact.* (*Pseudomonas*) *sesami* described by Malkoff (*Centralbl. für Bakt.*, Ab. 2, xvi, p. 664, 1906) are stated to agree with those of *Bact. solanacearum*, which has also been found occurring naturally on *Sesamum indicum* in Japan and Korea.

NAKATA (K.). **Concerning the vitality and pathogenicity of Bacterium solanacearum Smith, a cause of Tobacco wilt.**—*Journ. Sci. Agric. Soc.* (*Tokyo*), 296, pp. 283–304, 1927. [Japanese, with English summary.]

An investigation was made into the causes of the rapid loss of vitality and pathogenicity of the tobacco wilt organism (*Bacterium solanacearum*) [see preceding abstract] in culture. These properties were decreased or lost in synthetic media, e. g., Cohn's, Uschinsky's, or Czapek's solution and agar, while they were maintained or augmented in organic substrata, such as potato or milk. Vitality was maintained for 270 days in milk cultures, whereas in the above-mentioned synthetic media it was lost within 40 days. Even in milk, however, death occurred within ten days when the milk was sterilized at 10 lb. pressure for one or two hours. The organism was also less resistant to desiccation, sunlight, high temperatures, and hydrogen-ion concentration [see next abstract] in synthetic than in natural media. These facts suggest that some heat-labile substance allied to the vitamins is contained in natural media, especially milk, and contributes to the vitality of the organism. This substance, which is thought to be analogous to the 'specific factor' in human cancer [*R.A.M.*, iv, p. 687], also appears to increase the virulence of the organism, cultures of which from natural media caused rapid infection of unwounded host plants, though it is known to be normally a wound parasite.

NAKATA (K.). **Principles for controlling Tobacco wilt.**—*Journ. Sci. Agric. Soc.* (*Tokyo*), 298, pp. 389–411, 1 diag., 1927. [Japanese, with English summary.]

The causal organism of tobacco wilt (*Bacterium solanacearum*)

[see preceding abstracts] has been shown to attack about fifty species of plants, representing nine families. The viability of the organism was found to be maintained for less than seven months in diseased host tissue and only for a few days on seed, compared with fourteen months in the soil, and the last-named source of infection is therefore regarded as the most important. *Bact. solanacearum* ceases to grow and gradually dies when the 'detrimental water content' (D) of the soil is reached, this point corresponding to the 'wilting coefficient' and 'critical content-residue' of higher plants (*U.S. Dept. of Agric., Bureau of Plant Industry, Bull.* 230, 1912; *Soil Sci.*, ix, p. 471, 1920). The detrimental water-content was determined as 2·5 per cent. for sandy soil with a water-holding capacity (W) of 30·7, and 9·7 for clay with a water-holding capacity of 69·1 per cent.

Bact. solanacearum was found to grow only in soils with a reaction between P_H 6·0 and 8·1, though in pure cultures its limits of tolerance may be influenced by the kind of medium used. The organism is antagonistic to some of the micro-organisms occurring in the soil, its growth being inhibited when cultured in the presence of various fungi and bacteria [a list of which is given].

The practical application of the data obtained by these experiments should be based on the reduction of the water-content of the soil to a point detrimental to the growth of the organism; the adjustment of the soil reaction to a value below P_H 6·1 or above 8·1; and the inoculation of the soil with micro-organisms inhibitory to the development of *Bact. solanacearum*.

VALLEAU (W. D.) & JOHNSON (E. M.). **The effect of a strain of Tobacco mosaic on the yield and quality of Burley Tobacco.** —*Phytopath.*, xvii, 8, pp. 523–527, 1927.

Tobacco plantations in Kentucky are stated to be commonly affected with two types of mosaic, of which one causes severe stunting, distortion, burning, and distinct mottling of the leaves while the other only causes a slight retardation of growth, inconspicuous mottling, and infrequent distortion of the leaves, and is considered by the growers to be of small or no economic importance, particularly when the plants are infected late in the season. The experiments briefly described in this paper were conducted in 1926 in the field, with a view to determining the real effect of the second type of mosaic on the yield and quality of White Burley tobacco.

No appreciable reduction in yield occurred when the plants were inoculated at topping time, but when they were inoculated at setting time they yielded a third less in weight than the controls. Their leaves, in the latter case, averaged from three to four inches shorter than those of the controls, and were of a poorer quality, falling into nine grades as against six grades for the leaves from healthy plants. On the base of the advances paid by the co-operative association for the various grades, it is calculated that early infection resulted in a reduction of 43·1 per cent. in the value of a given weight of tobacco, and of 61·7 per cent. on an acre basis. Although late inoculation did not reduce the yield in weight, it resulted in a reduction of 25·1 per cent. in the value of

the crop, a difference which is stated to have been difficult to predict from the appearance of the plants at cutting time.

It is suggested that the discoloration observed in the cured leaves may have been due to the disorganization of the chloroplasts during the curing process, and to the partial or complete destruction of other cell constituents following inoculation, on the lines described by Miss Eckerson in the case of tomato mosaic [*R.A.M.*, v, p. 523]. The necessity is advocated for developing cultural methods which will not only prevent initial mosaic infection, but will reduce the spread of the disease during the whole vegetation of the plants.

VALLEAU (W. D.) & JOHNSON (E. M.). **Commercial Tobaccos and cured leaf as a source of mosaic disease in Tobacco.**—*Phytopath.*, xvii, 8, pp. 513–522, 1927.

This is the full paper of which an abstract has already been noted [*R.A.M.*, vi, p. 515]. Besides tobacco plants, the mosaic inoculum carried on the fingers of inveterate cigarette smokers is stated to be dangerous to other susceptible plants, e. g., tomatoes, which are handled during cultivation. It is believed that many sporadic outbreaks of mosaic in isolated tobacco or tomato plots may have originated in this way. The authors are of opinion that mosaic rarely, if ever, develops in tobacco seed-beds not touched by man after sowing. Commercial tobacco redried at 165° F. for 40 minutes was still found capable of causing 100 per cent. infection.

KOTTE (W.). **Ueber die Ursache und die Bekämpfung der neuen Blattfleckenkrankheit des Tabaks.** [On the cause and control of the new leaf spot disease of Tobacco.]—*Badisches Landw. Wochenbl.*, xcv, 34, pp. 481–482, 1927.

Since 1924 the tobacco plantations of Baden and the Palatinate have been seriously affected by a leaf spot [the symptoms of which are described: see next abstract and above, p. 65]. In very severe cases the leaf is almost entirely destroyed, only the midrib remaining, while under certain conditions the progress of the disease is completely arrested and the foliage practically regains its normal appearance. A bacterium has been constantly isolated from diseased material and inoculation experiments with this organism on healthy plants gave positive results. Pending further information as to the nature and life-history of the bacterium, and other important points in connexion with the etiology of the disease, growers are recommended to take every precaution against the spread of infection in the field.

KOTTE (W.). **Der Bakterienbrand des Tabaks, seine Ursache und seine Bekämpfung.** [The bacterial blight of Tobacco, its cause and control.]—*Badisches Landw. Wochenbl.*, xcv, 40, pp. 577–578, 1927.

The bacterial blight of tobacco in Baden and the Palatinate [see preceding abstract] has now been definitely shown to agree with wildfire (*Bacterium tabacum*) occurring in the United States [*R.A.M.*, vi, p. 443]. The writer prefers the name 'bacterial

blight' to the 'red rust' or 'frog eye' of popular usage, neither of these being applicable to the symptoms of the disease reported for the first time from Germany. A description is given of bacterial blight, with recommendations for its control based on American investigations and personal observations in the affected districts of Germany. The causal organism is thought to have been introduced into Baden with American tobacco for manufacture and disseminated with the dust from the factories, which is commonly used as a fertilizer for gardens and seed-beds.

KOTTE (W.). **Der Bakterienbrand des Tabaks, eine für Deutschland neue Pflanzenkrankheit.** [The bacterial blight of Tobacco, a new plant disease for Germany.]—*Deutsche Landw. Presse*, liv, 51, pp. 714–715, 4 figs., 1927.

This paper contains an account of the writer's observations in connexion with the bacterial blight of tobacco recently reported from Baden and the Palatinate [see preceding abstracts]. It is here definitely stated that *Bacterium tabacum* was isolated from diseased leaves and that healthy plants inoculated with this organism developed the typical wildfire symptoms, which are illustrated by photographs.

STAPP (C.). **Das 'Wildfeuer', eine bakterielle Blattfleckenkrankheit des Tabaks.** [Wildfire, a bacterial leaf spot disease of Tobacco.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 12, pp. 115–118, 1927.

After reviewing the most important previous and current literature on wildfire of tobacco (*Bacterium tabacum*), the writer points out that the first object of German investigators must be to ascertain whether the causal organism of the disease newly reported from Baden [see preceding abstracts] is identical with the American bacterium. The writer was informed by Kern in conversation that the causal organism of the disease in Hungary had not been definitely identified with *Bact. tabacum*. Attention must further be paid to the possibilities of securing resistant varieties by hybridization and selection. It is suggested that the term 'wildfire' should be retained, as being both applicable to the symptoms and more distinctive than 'bacterial blight'.

SMALL (T.). **Rhizoctonia 'foot-rot' of the Tomato.**—*Ann. of Appl. Biol.*, xiv, 3, pp. 290–295, 1927.

This paper reproduces most of the information contained in the author's previous paper on the foot rot disease of tomatoes caused by *Rhizoctonia solani* [*R.A.M.*, v, p. 635]. The only new point of interest mentioned is that during the season of 1926 there were indications that the incidence of the disease in the trial plots was slightly reduced by a top dressing of sulphate of ammonia, and was practically checked by using a 0·25 per cent. solution of uspulun in sufficient quantity to saturate the soil.

JAENICKE (A.). **Einiges über Tomatenkrankheiten unter Glas im Jahre 1927.** [Some notes on Tomato diseases under glass in the year 1927.]—*Obst- und Gemüsebau*, lxxiii, 17, pp. 261–263, 3 figs., 1927.

A number of fungous diseases occurred in 1927 among the tomatoes growing under glass in close proximity to the factory quarter of a large industrial town. Heavy damage was caused by a species of *Fusarium*, which was present in the soil and destroyed almost 6,000 plants grown from seed disinfected with uspulun, notwithstanding daily applications to the seedlings of the same preparation. The fungus was finally arrested by spraying with 3 per cent. uspulun and by treating the plants with potash. The fruits of this variety (Andalusier Treib) were eventually attacked by dry rot, from which the Westländische Treib is apparently immune. Grey mould [? *Cladosporium fulvum*] was also responsible for much damage. Heavy losses were further caused by canker [*Didymella lycopersici*], and the application of uspulun to the affected plants imparted a flavour of carbolic acid to the fruit which persisted even after cooking and resulted in a serious reduction of custom. The Lucullus, Condine Red, and Westländische Treib varieties proved resistant.

DAY (W. R.). **The Oak mildew Microsphaera quercina (Schw.) Burrill and Armillaria mellea (Vahl.) Quél. in relation to the dying back of Oak.**—*Forestry*, i, 1, pp. 108–112, 1927.

The dying-off of oak is regarded as possibly the most serious forest disease at present occurring in Europe, and in this paper some of the more important recent articles on the practical silvicultural aspect of the problem are summarized and discussed. The chief losses from dying-off are stated to have occurred in high forests, the coppice system having declined in importance of recent years. The only important commercial species of oak seriously affected by mildew (*Microsphaera quercina*) is *Quercus pedunculata*, which is dying off in great numbers in various parts of Europe [*R.A.M.*, vi, p. 452]. The other principal silvicultural species, *Q. sessiliflora*, is much less liable to extinction by reason of its immunity from caterpillar invasion and the subsequent infection by mildew on the summer shoots. When grown as coppice, however, it may be seriously injured by the mildew. In 1902, when the first symptoms of dying-off were observed in Jugo-Slavia [ibid., vi, p. 5], oak mildew had not been recorded in that country or even, so far as is known, in Europe. The severe outbreaks of the disease, however, appear to date from the development of *M. quercina* in the affected regions. Falck has shown the importance of *Armillaria mellea* in relation to dying-off [ibid., iv, p. 517]. Notes are given on the silvicultural methods regarded as likely to reduce the incidence of the disease, and a bibliography of 19 titles is appended.

BRUSSOFF (A.). **Kritische Bemerkungen zu dem Artikel über das Ulmensterben von Gräfin von Linden und Lydia Zenneck.** [Critical observations on the article by Gräfin von Linden and

Lydia Zenneck concerning the die-back of Elms.]—*Centralbl. für Bakt.*, Ab. 2, lxxi, 8–14, pp. 298–300, 1927.

The writer considers that no proof has been given by Gräfin von Linden and Lydia Zenneck of the implication of *Graphium ulmi* in the etiology of the die-back of elms [*R.A.M.*, vi, p. 518]. No explanation is forthcoming of the characteristic obstruction of the vessels, in which the fungus is not shown to be involved. The article in question is, moreover, largely based on a paper by Lüstner, which appeared in *Gartenkunst* for June, 1925, and cannot be regarded as the outcome of independent scientific research.

LINDEN (GRÄFIN V.) & ZENNECK (LYDIA). **Erwiderung auf die kritischen Bemerkungen von Brussoff zum Ulmensterben.** [Reply to Brussoff's critical observations on the die-back of Elms.]—*Centralbl. für Bakt.*, Ab. 2, lxxi, 8–14, pp. 300–302, 1927.

Referring to Brussoff's criticism of their paper on the die-back of elms [see preceding abstract], the writers defend their methods of investigation, and explain that vascular obstruction was not a primary feature of the material examined. This was characterized, on the other hand, by discoloration, distension, and disintegration of the vascular bundles. Miss Schwarz has shown that *Graphium ulmi* is responsible for the first-named symptom, and the writers' own investigations clearly indicate that this organism also causes the other manifestations of die-back. All the data obtained by the authors are stated to support Miss Schwarz's view of the downward progression of infection, which is contradicted by Brussoff.

JANSON (A.). **Ueber den Schorf und andere Korbweidenschädlinge.** [On scab and other Osier pests.]—*Nachricht. über Schädlingsbekämpf.*, ii, 3, pp. 161–164, 1927.

An account is given of willow scab (*Fusicladium*) [*saliciperdum*: *R.A.M.*, vi, p. 520], which is stated to be particularly prevalent in the neighbourhood of Berlin and on the Oder in fen soils deficient in potash. The American willow [*Salix americana*] is highly susceptible, while crosses between *S. viminalis* and the purple, Caspian, and almond willows [*S. purpurea*, *S. daphnoides* and *S. triandra*] appear to be immune. In addition to appropriate cultural measures, the writer recommends the application of 0·75 to 1 per cent. nosprasen [directions for the preparation of which are given].

Loi étendant aux animaux, insectes, cryptogames et végétaux nuisibles certaines dispositions de la loi sur la police rurale. [Decree extending to harmful animals, insects, fungi, and plants certain provisions of the law concerning the rural police.]—*Prog. Agric. et Vitic.*, lxxxviii, 34, pp. 188–189, 1927.

This Decree amending the laws concerning the control of plant parasites in France provides that, when damage appears likely to become serious, Prefects are to prescribe the necessary control measures. When such measures are required to be carried out by State or other public bodies, the Prefect may, in case of delay beyond

the time limits specified, order the work to be done at the expense of the body concerned. If the damage appears particularly threatening the Prefect will form a Committee of Defence, which will act under the technical control of the Ministry of Agriculture. After consultation with the Committee, the Minister will define by decree the area affected. In the event of the control measures prescribed by the Prefect not being carried out, or being ineffective, the Prefect can order the compulsory destruction of the affected plants by the committee. The expenses incurred by the committee in carrying out control measures are to be borne by the growers themselves, in proportion to the rateable value of their land.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, 10, 1927.

France. The *Journal Officiel de la République Française*, 6, p. 385, 1927, recapitulates the conditions on which the French Phytopathological Service issues certificates to the exporters of plants. Such certificates are furnished only to persons whose premises are under the regular supervision of the Phytopathological Service. Applications for registration in the books of the Service must be renewed annually during January or by 1st April at the latest.

Manitoba: An Act to prevent the introduction and spread of insect pests and fungus diseases.—3 pp., Govt. of Manitoba, 1927.

By the Plant Pests Act, which came into force in Manitoba on 1st September, 1927, the following plant diseases [the list of which may be extended] have become notifiable: black knot [*Dibotryon morbosum*], raspberry mosaic, raspberry leaf curl, and fireblight [*Bacillus amylovorus*]. Inspectors may be appointed, empowered to destroy diseased plants and to order precautions to be taken against the spread of disease in any premises where it may exist. All plants brought into Manitoba will be inspected, and either be certified as free from disease or destroyed.

No person may keep, or offer for sale or exchange, any diseased plant, or sell or dispose of any diseased fruit. Diseased plants in orchards must either be destroyed, or treated as prescribed by the Minister.

Nurseries must be registered annually, and plants must not be sent out from any nursery until it has been certified as apparently free from disease, such certificate to hold good for one year.

Union of South Africa. Act to provide for the eradication of the Citrus disease called psorosis or scaly bark.—3 pp., 1927.

This Act (No. 42: to be cited as the Psorosis Act, 1927) provides for the destruction, without compensation, of any citrus tree infected, or suspected of infection, by psorosis or scaly bark [*R.A.M.*, v, p. 487] within the Union of South Africa. The importation of infected trees into, and their conveyance within, the Union are also prohibited.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

APPLIED MYCOLOGY

VOL. VII | MARCH | 1928

HEDGCOCK (G. G.). **Dothichiza populea and its mode of infection.**—*Phytopath.*, xvii, 8, pp. 545–547, 1927.

After pointing out that the life-history of *Dothichiza populea* [*R.A.M.*, iii, p. 244] is not yet fully known, the author briefly describes two series of experiments made by him under natural conditions in 1922 at Washington, in one of which he inoculated the leaves of several species of poplar and of one species of willow with a spore suspension, while in the second, trees of the same species were inoculated by inserting spore tendrils of the fungus in wounds made in the bark by means of a sterile knife. In the first series positive results, with consequent twig infection, were obtained on *Populus nigra italica*, *P. deltoides*, *P. eugenei*, and an undetermined species of poplar, while in the second series the inoculations only succeeded on *P. nigra italica* and *P. eugenei*.

These results would tend to indicate that *D. populea* may infect poplar trees by progressive infection from the leaves through the petioles to the twigs and limbs, and also by direct entrance through wounds. It is thought possible that the entrance of the fungus through the leaves might be prevented, especially in nurseries, by spraying the trees with Bordeaux mixture or other fungicides at the time when the leaves are expanding, and again after each heavy rain for a month thereafter.

Since the first report of the disease in North America in 1916, the known range of *D. populea* has considerably extended in the northern and north-eastern United States, and south-eastern Canada, probably through shipments of diseased nursery stocks.

Abbauerscheinungen bei der amerikanischen Weide. [Symptoms of degeneration in the American Willow.]—*Der Deutsche Korbweidenzüchter*, Juliheft, pp. 75–76, 1927.

From all parts of Germany complaints have been received concerning a die-back of American osiers [*Salix americana*], which has been shown to be largely due to infection by *Fusicladium saliciperdum* [*R.A.M.*, vii, p. 127], while unfavourable weather and soil conditions are also partially responsible. The purple, almond, and hemp willows [*S. purpurea*, *S. triandra*, and *S. vimi-*

nalis] appear to be immune. Evidence has been obtained that the fungus is carried on cuttings, so that great care should be taken to use only material from a reliable source for new plantations. Other control measures should include the destruction of diseased material and fallen leaves; burning over the plantations in the winter; the application of 2 per cent. Bordeaux mixture before and after the development of the first shoots; and a sparing use of nitrogenous manures.

Larch canker (Dasyscypha calycina Fuckel).—*Forestry Comm. Leaflet* 16, 4 pp., 3 figs., 1927.

Larch canker (*Dasyscypha calycina*), the symptoms and mode of infection of which are briefly described, is stated to be present in nearly every plantation of the common larch (*Larix europaea*) in Britain. Japanese larch (*Larix leptolepis*) is seldom attacked, but the West American larch (*Larix occidentalis*) is highly susceptible.

Control measures, directed at promoting the vigour of the individual tree, are indicated.

CAUDA (A.). **Il bacterio dell' imbrunimento di legni sommersi. 'Bacterium acrosporigenes humifaciens' Cauda.** [The bacterium causing the brown discoloration of submerged wood (*Bacterium acrosporigenes humifaciens* Cauda).]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxiv, 1, pp. 182–183, 1927.

The brown discoloration of submerged wood is usually attributed to the action of fungi, but the author's microscopic examination of fresh material revealed the presence of minute, ovoid, acrosporogenous bacteria in such large numbers as to suggest that these are the primary cause of the manifestation.

The organism was isolated and its cultural characters on various media are described. On sawn fir or chestnut wood shavings in water, highly motile, ovoid, acrosporogenous forms, with translucent spores, develop in 24 hours. A black or brown discoloration of the wood shavings is apparent, due to a process of humification.

The organism responsible for this phenomenon, to which the name *Bacterium acrosporigenes humifaciens* has been given, is markedly thermophile and develops well in the absence of light, under anaerobic conditions, at a temperature of 35° to 40° C.

CURTIN (L. P.). **Experiments in wood preservation. I. Production of acid by wood-rotting fungi.**—*Indus. and Engin. Chem.*, xix, 8, pp. 878–881, 1927.

About 93 per cent. of the poles installed by the Western Union Telegraph Company of New York are creosoted, chestnuts [*Castanea dentata*] and cedars (*Chamaecyparis thyoides, Thuja occidentalis,* and *T. plicata*) being butt treated, while yellow pine [*Pinus palustris*, &c.] is given a full-length creosoting under pressure. Of the 2,397,978, poles treated with preservatives in the United States in 1925, 1,325,260 were cedars, 780,248 southern yellow pine, and 276,030 chestnuts. Of the last-named, 150,000 were installed in Western Union lines. In the same year, 167,642,790 galls. of creosote were used for wood preservation in

the United States, 53·3 per cent. being imported [cf. *R.A.M.*, v, p. 200]. The quantities of petroleum and zinc chloride used were 13,048,539 galls. and 26,378,658 lb., respectively.

Hitherto coal-tar creosote has been the leading preservative in the United States because it combines toxicity and fair durability with desirable mechanical properties, e.g., waterproofing, fibre-binding, and lubrication. Its most serious drawbacks are its high cost (14 cents per gall.) and the difficulty of procuring it in adequate quantities. An example is cited showing that the creosote (15 galls.) absorbed by a 20-foot yellow pine pole, 11 cu. ft. in volume, costs slightly more than the pole itself. The cost of creosoting is regarded as a serious problem which is bound to be further complicated by the gradual disappearance [owing to blight: *Endothia parasitica*] of the chestnut, the treatment of which is relatively inexpensive. Zinc chloride, sodium fluoride, and copper sulphate are subject to leaching out and are therefore not suitable for use where the installations are expected to last more than ten to twelve years. The writer is engaged, on behalf of the Western Union, in investigations on the development of an efficient substitute for creosote.

Cultures of the wood-rotting organisms, *Fomes annosus*, *Lenzites sepiaria*, *Lentinus lepideus*, *Polyporus pilotae*, and *P. sulphureus*, as well as of *Rhizopus nigricans* and *Penicillium* sp., were obtained from the United States Forest Products Laboratory, and grown in various nutrient media, with a view to determining, by means of indicators added to the media, whether they were capable of forming acids.

Methyl orange was found to be a very satisfactory indicator for the moulds, but neither this nor Congo red was sufficiently sensitive for the wood-rotting organisms. Sodium alizarin sulphonate proved to be an excellent indicator for the latter group, the cultures assuming a greenish-yellow tint within a fortnight, which was replaced by the original red when sodium carbonate was added after melting the culture in hot water. A similar decolorization was produced on sap wood sticks of yellow pine and white cedar treated with the indicator and placed in contact with a pure culture of *F. annosus*, showing that the production of acids occurs in wood as well as in artificial nutrient media.

A study of the indicator reactions showed that the acid solution produced by the wood-rotting organisms has a P_H value of approximately 5. This is not a high degree of acidity, but it must be remembered that its action on decaying wood may be prolonged for years. Moreover, the acid thus produced may considerably assist in the liberation of carbohydrates which serve for the nutrition of the wood-rotting fungi.

MURPHY (P. A.). **Some fungus diseases of root crops.**—*Journ. Dept. Lands & Agric. Ireland*, xxvii, 1, pp. 12–23, 2 pl., 1927.

This article gives a detailed account in popular terms of the more common diseases of root crops in Ireland, and also indicates methods of control.

Club-root of crucifers (*Plasmodiophora brassicae*) is general throughout the country, but seldom serious. Control by liming is

advised, together with adequate drainage. Where the disease is likely to occur, a dressing with nitrate of soda or basic slag should be given. Mildew (*Erysiphe polygoni*) is said to be very common on turnips and swedes, particularly the latter. The attack usually begins late in August and may continue throughout September, though by October the disease is usually thrown off. In severe cases the yield may be reduced by as much as two tons per acre. Severe attacks are said to cause the roots to crack around the crown. Dry rot of swedes and turnips (*Phoma napo-brassicae*) [*P. lingam*: *R.A.M.*, vii, p. 70] occurs much more severely in some years than others. It can cause considerable damage to swedes, but turnips are much less affected. The disease can usually be checked by keeping the manure free from infective material; adequate rotation; and the use of suitable varieties, of which Incomparable Green Top, Keepwell, and Magnum Bonum are generally considered resistant. Risk of brown rot (*Bacterium campestre*) [*Pseudomonas campestris*], and white rot (*Pseudomonas destructans* or *Bacillus carotovorus*) can be averted by good rotation. Root burn [root rot] of mangolds and sugar beet, associated with *Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*, causes serious harm to the latter crop; against this disease the author advises hurrying the plant through the dangerous seedling period and also that thinning should not take place until the four-leaved stage is reached, when it is easy to recognize the healthy individuals.

Dry rot of mangolds and sugar beet (also caused by *P. betae*) was recognized in Ireland as a storage rot of the former crop as early as 1895. The fungus forms concentric rings on the leaf blade and the decayed portions fall out, giving the leaf a ragged appearance. The hollow surface of the leaf stalks is also attacked and the invasion of the crown and root follows, producing a rot. The peculiar type of crown rot, associated with *P. betae*, which occurs in the summer on the growing crop on the Continent, does not develop in Ireland, where the decay begins in the field in the autumn and continues during storage. No direct measures can be taken against this disease.

Leaf spot (*Cercospora beticola*) has been found on sugar beet in Ireland, but is not expected to cause appreciable damage on account of the low summer temperature. Yellow leaf (*Clasterosporium* [*Sporodesmium*] *putrefaciens*) has been observed in the autumn and can apparently lead to a reduced sugar content. Rust of mangolds and beet (*Uromyces betae*) is occasionally complained of, but causes no material damage, while crown gall (*Bact. tumefaciens*) is not infrequently recorded and, though it is not serious, the destruction of diseased plants is recommended to prevent contamination of the ground.

Ten Doornkat Koolman (H.). **Die Brennfleckenkrankheit der Gartenbohne im Lichte der Vererbung. Versuche zur Immunit tszüchtung bei Phaseolus vulgaris gegenüber Colletotrichum lindemuthianum (Sacc. & Magn.) und seinen Biotypen.** [Anthracnose of the garden Bean in the light of heredity. Experiments in breeding *Phaseolus vulgaris* for

immunity from *Colletotrichum lindemuthianum* (Sacc. & Magn.) and its biotypes.]—*Forsch. auf dem Gebiet der Pflanzenkrankh. und der Immunität im Pflanzenreich*, iv, pp. 112–232, 7 pl., 13 figs., 1 graph, 1927.

The first part of this paper is an amplified recapitulation of the results obtained by the author and Bredemann in their previous investigations on the selection of *Phaseolus vulgaris* for immunity from anthracnose (*Colletotrichum lindemuthianum*) [*R.A.M.*, vi, p. 456].

In a recent series of experiments with ten European and eight American biological strains of the fungus, marked individual differences in virulence were observed, and these were shown to be due, not only to environmental modifications, but also to inherent biological characters. Of the two Swedish strains 3a and 3b, the latter showed considerable affinity with various German strains, whereas 3a differed from all the other strains, both European and American, and was so virulent that it attacked resistant species and varieties of beans, as shown by inoculation experiments on wounded fruits of *P. multiflorus*. On the other hand, the Eins variety, which is highly susceptible to the other biological strains used, proved resistant to 3a. The great virulence of this strain is further exemplified by the very rapid development of spores both on the host and in culture.

The best method of obtaining varieties resistant to all the biological forms of *C. lindemuthianum* is to inoculate all the seedlings of the F_2 generation with a mixture of all available strains of the fungus, and to use only the survivors in selection experiments.

The author considers that there is little likelihood of obtaining a desirable habit of growth by crossing the runner and bush types, this object being probably attainable by selfing within the bush types, especially among erect varieties.

A bibliography of five pages is appended.

Nicolaisen (N.). **Wie verhalten sich die einzelnen Buschbohnensorten zur Brennfleckenkrankheit?** [How do individual varieties of Bush Beans react to anthracnose?]—*Nachricht. über Schädlingsbekämpf.*, ii, 2, pp. 80–82, 1927.

Of 21 varieties of bush beans [*Phaseolus vulgaris*] tested for their reaction to anthracnose [*Colletotrichum lindemuthianum*] at Calbe (Saxony) in 1926, 11 were immune, 5 resistant, and 5 very susceptible. The first group included white flageolet, white kidney, Zucker Perl Princess, stringless Zucker Butter Brech, and Genfer Markt (with dark brown seeds); the second, two strains of Hinrich's Riesen; and the third, Kaiser Wilhelm, Kaiser Wilhelm Riesen, and Schlachtschwert. Of the three varieties grown by the German Agricultural Society, Ideal was immune, Hinrich's Riesen rather severely attacked, and the early maturing Johannisgold killed by the disease. In addition to appropriate cultural measures [which are indicated], the writer recommends, for the control of anthracnose, plentiful applications of lime and superphosphate and seed disinfection with 0·25 per cent. uspulun.

Böning (K.). **Die Mosaikkrankheit der Ackerbohne (Vicia faba L.). Ein Beitrag zu dem Mosaik der Papilionaceen.** [The mosaic disease of the Broad Bean (*Vicia faba* L.). A contribution to the mosaic of the Papilionaceae.]—*Forsch. auf dem Gebiet der Pflanzenkrankh. und der Immunität im Pflanzenreich*, iv, pp. 43–111, 21 figs., 1927.

The external symptoms of mosaic on broad beans (*Vicia faba*) fall into two groups, the first comprising the primary manifestations on the leaf, and the second the effects of the disease on the growth and development of the entire plant. Two exactly contrasting types of symptoms occur on the leaves, namely, mottling, in which the narrow healthy areas along the midribs and accessory veins are sharply delimited from the pale, diseased portions of the leaf; and vein mosaic, characterized by the development of light stripes along the veins, the intercostal areas mostly remaining healthy. The former type of mosaic is by far the most common, and so far the vein symptoms have only been observed in the field, cross-inoculation experiments with the two forms resulting in the development of mottling alone.

The symptoms of mosaic first become apparent when the pinnate leaves begin to show above the leaf base. Occasionally the affected leaves are abnormally narrow and elongated (lancet-shaped) or round and stunted, the latter form being associated chiefly with vein mosaic; but the most frequent characteristic of diseased foliage is a tendency to irregular curling and rolling of the margins, almost always in the secondary shoots. The occurrence of necrotic stripes in severely diseased leaves or stems is a special feature of vein mosaic. These fusiform necrotic areas are confined to the primary cortical cells, and though they may extend to the phloem they never proceed from it, as in the case of phloem necrosis of the potato [*R.A.M.*, ii, p. 569]. This type of mosaic seems to be similar to stipple-streak [ibid., vi, p. 114] in that it results from a combination of different viruses.

A reduction of turgescence and retardation of development are the most marked general features of bean mosaic. Only in severe cases are the inflorescences affected by curling and mottling.

Histological examination showed that changes in the tissues become recognizable at the same time as the external symptoms. Primarily infected leaves remain in a juvenile state and do not differentiate into palisade and spongy parenchyma as in normal foliage. Diseased areas fail to attain the normal thickness and the infected tissues of older leaves approximate in this respect to the healthy tissues of young ones. With increasing age these anatomical differences almost disappear and the diseased areas are less clearly visible by transmitted light.

In certain severe types of vein mosaic the histological relations are somewhat modified. The diseased areas in such cases frequently show the absence of any chlorophyll or chloroplast formation, the tissue remaining in quite a juvenile state without any differentiation of the mesophyll, and the epidermis is frequently hypertrophied. In other cases chlorophyll develops in the cell layers immediately underlying the epidermis, resembling true variegation rather than mosaic disease. The highly sensitive

tissues exhibit necrotic phenomena. In milder types of vein mosaic the development of the pathological tissues is similar to that of ordinary mottling mosaic. Diseased stems showed only isolated bundles at the tenth internode with no development of the interfascicular cambium found in healthy individuals.

The so-called 'albicatio' mosaic is characterized by the formation of a white margin on the second and third pinnate leaves, the rest of the foliage being quite normal. This white margin consisted of pale cells with a watery content. The tissues were somewhat thinner than in the normal leaf, and leucoplasts were present in many cells. Unlike ordinary mosaic, the diseased areas on albicate leaves showed the development of palisade tissues almost like that in normal leaves, while the transference of starch also appears to be quite normal.

There are two types of leaf roll of *V. faba*, one characterized by the upward curling of the leaf margins, and a second, in which the leaf surface is covered with numerous pale spots, less distinct than those of true mosaic. Experiments have shown that the disease is not infectious. Affected leaves are thicker than normal ones and of a greyish colour: they often turn yellow and die prematurely. The diseased tissue is hypertrophied without appearing pathological.

The results of experiments [which are fully described] showed that bean mosaic is transmissible from diseased to healthy plants by various aphids (*Aphis fabae* [*A. rumicis*: cf. ibid., vi, p. 592], *Macrosiphum pisi*, and *Rhopalosiphum viciae*), cicadas (probably *Typhlocyba picta* and *Chlorita solani*), and possibly also by *Thrips flavus*. The insects became virulent after feeding on infected plants for very short periods (ten minutes to two hours), the best results being given by older individuals, though aphids of all ages were capable of transmitting the disease in its various stages. No evidence of the transmission of infection by the seed was obtained. Similar experiments with leaf roll gave negative results, but there were some indications in this case that the disease is transmissible by the seed.

Mosaic was found to occur more severely on plants growing in heavy clay soil than in sand or a mixture of sand and peat. Young plants are much more susceptible than older ones. Both the small and large types of *V. faba* (var. *minor* and var. *major*) are liable to infection and, so far, no evidence of marked difference in varietal reaction has been obtained.

Cross-inoculation experiments showed that bean mosaic is transmissible to other Papilionaceae (red and crimson clover [*Trifolium pratense* and *T. incarnatum*] and peas), and it is considered likely that the disease is identical with pea mosaic [ibid., v, p. 337] and overwinters in a similar manner on clover.

Preliminary estimates of the economic importance of bean mosaic indicate that under normal conditions a loss of 5 to 10 per cent. of the crop may be expected. Control measures should be based on the extermination of the insect vectors, the application to the soil of potash and phosphorus (especially the latter), the selection of rapidly growing, one-stemmed varieties, and the avoidance of proximity to clover.

SCHAFFNIT (E.). **Ueber die wechselseitige Uebertragbarkeit der Mosaikkrankheiten von Rübe und Spinat.** [On the intertransmissibility of the mosaic diseases of Beet and Spinach.] —*Centralbl. für Bakt.*, Ab. 2, lxxi, 15–24, pp. 490–497, 3 figs., 1927.

After briefly reproducing McClintock's and Smith's description of the mosaic disease of spinach (*Journ. Agric. Res.*, xiv, 1918), the author states that the disease has been found to occur in the fields around Bonn. In a series of experiments [some details of which are given] he succeeded in showing that the disease is transmissible by the agency of insects (*Aphis fabae* [*A. rumicis*], an undetermined species of *Macrosiphum*, and probably also by *Thrips tabaci*) from spinach to beet (mangolds), and vice versa, thus indicating that the spinach and beet mosaics [ibid., vi, p. 591] are closely related if not identical. It is pointed out, however, that the manifestations of the disease differ in some important features on the two hosts. Thus, while on spinach mosaic is transmissible by artificial inoculation of the expressed juices from diseased specimens, all attempts thus to reproduce it in the beet have, so far, proved failures. Further, while infected spinach plants are severely affected and may even be killed by the disease when attacked at an early stage of development, the symptoms in beet do not go beyond a more or less severe retardation in growth and a reduction in yield.

SEVERIN (H. H. P.) & SEVERIN (H. C.). **Curly-top of Sugar Beets in South Dakota.**—*Journ. Econ. Entom.*, xx, 4, pp. 585–588, 1927.

In the summer of 1926 a few cases of curly top of sugar beets occurred in the west-central part of South Dakota, but during two extensive surveys made by the authors, in which the natural hosts of the beet leafhopper (*Eutettix tenella*) [*R.A.M.*, v, pp. 339, 460; vi, p. 455], including the saltbushes (*Atriplex* spp.), *Salsola kali tenuifolia*, and several species of *Chenopodium*, were swept with an insect-net, not one specimen of *E. tenella* was captured.

The district is semi-arid, with an average rainfall of under 15 in. (an amount tolerated by beet leafhoppers in the natural breeding grounds in California), and with alkaline depressions bearing the host plants. If *E. tenella* was responsible for the diseased sugar beets found, South Dakota may prove to be the eastern limit of a natural breeding ground of the insect vector, or migration may occur from outside the State.

Under greenhouse conditions in California, non-infective beet leafhoppers transmitted the disease from six of the affected South Dakota sugar beets to healthy beet seedlings.

KNOWLTON (G. F.). **Beet leafhopper and curly top situation in Utah.**—*Utah Agric. Exper. Stat. Circ.* 65, 1927. [Abs. in *Facts about Sugar*, xxii, 32, p. 768, 1927.]

The writer briefly reviews the present state of knowledge of the curly top disease of sugar beets and its insect vector, *Eutettix tenella* [see last abstract]. These leafhoppers are generally distri-

buted over the western United States and have been reported from one locality in Florida. Migrations usually occur when the great areas of weeds (salt bushes and Russian thistle) [*Atriplex* spp. and *Salsola kali*] on which they feed become dry; beet fields in arid sections are often most seriously attacked when the insects disperse in search of new food supplies. Early plantings have been observed to suffer less from curly top than late ones. Insecticides are useless in the control of *E. tenella*, the migrations of which may be predicted in certain areas by careful entomological studies. In such years beets should not be planted.

MILLARD (W. A.) & BEELEY (F.). **Mangel scab—its cause and histogeny.**—*Ann. of Appl. Biol.*, xiv, 3, pp. 296–311, 4 pl., 1 fig., 1927.

In giving a detailed description of their study of the causes and pathogenic histogeny of scab of mangolds (*Actinomyces* spp.), the authors distinguish two types of the disease, on the ground of the macroscopic symptoms, by the self-descriptive names of raised and pitted scab, respectively. The former may be further subdivided into mound and knob scab, according to whether the lesions present a flat or concave upper surface with gently sloping sides, or are in the form of irregular, knobby, and frequently somewhat stalked tumours. A histological examination of the lesions showed that in both forms of raised scab the first response of the host tissues to parasitic attack is an active meristematic proliferation of the outer pericycle so as to form a mound-like protuberance, with subsequent suberization of the outer layers of the freshly formed pericyclic tissue. One or more adventitious rings of vascular bundles may also arise in the proliferated pericycle of the scab tissue. In pitted scab there is no proliferation of the pericycle, and the first symptom is the formation of a shallow pit, which subsequently becomes lined with a saucer-shaped layer of cork up to ten cells deep. This layer is frequently penetrated by the causal organism, which may reach and destroy the first and possibly the second vascular ring at the seat of infection, when the process of cork formation is repeated, thus forcing the scab tissues upwards and forming a wrinkled, corky mass, slightly raised above the surface

Isolations from the tissues of pitted scabs yielded a species of *Actinomyces* which was identified as *A. scabies* (Thaxter) Güssow, emend. M. et B. [*R.A.M.*, vi, p. 180]; it is stated that the same type of scab was also produced on mangolds by inoculating them with a stock culture of this organism from potato scab. Tissues from raised scabs yielded, besides bacteria, five different strains of *Actinomyces*, of which one proved to be the causal organism of the disease. From the cultural characters of the latter [which are described for various media] the authors consider that the organism merits specific rank and therefore name it *A. tumuli*. It is believed, however, that the knob type of raised scab, as distinct from the mound type, may be caused by a separate strain of this species, which exerts a stronger irritation stimulus on the tissues invaded.

COSTA (T.). **L'aureola di antocianina nelle 'tacche' della Cercospora beticola (Sacc.).** [The anthocyanin halo in the 'spots' of *Cercospora beticola* Sacc.]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxiv, 1, pp. 168–170, 1927.

In 1924, and again in 1925–6, the writer observed that beet plants of a pure line with a red hypocotylous zone showed a red halo, evidently due to anthocyanin, surrounding spots on their leaves caused by *Cercospora beticola.* Infection by this fungus also became manifest four days earlier on these plants than on those with green hypocotyls, owing to the localization of anthocyanin round the point of attack. In cases of doubtful classification of hybrids, the author suggests that the reaction to *C. beticola* may therefore serve as a diagnostic character for the differentiation of the red and green lines of beet.

JANSON (A.). **Eine neue Champignonkrankheit.** [A new Mushroom disease.]—*Gartenwelt*, xxxi, 34, p. 519, 1927.

A brief account is given of a disease of cultivated mushrooms which is stated to have been very prevalent in Germany during the last two years. The pilei and stipes are distorted by bulbous excrescences, evidently produced by a fungus which may be present in the soil or manure, or carried by the mushroom fly.

HENGL (F.). **Die Bekämpfung der Peronospora und der Traubenwickler in Deutschland.** [The control of *Peronospora* and the Vine moth in Germany.]—*Die Landwirtschaft*, p. 15, 1927. [Abs. in *Fortschr. der Landw.*, ii, 16, pp. 537–538, 1927.]

Observations made by the writer during his recent tour of inspection of the German vineyards have shown that Bordeaux mixture is the sole preparation affording completely satisfactory protection against downy mildew (*Peronospora*) [*Plasmopara viticola*]. This agrees with the results of Austrian experiments. Nosprasen and nosperal [*R.A.M.*, vi, p. 595] are applied at similar concentrations to those recommended for Austria, i.e., in quantities entirely precluding their profitable use. The former is also used for the combined control of downy mildew and the vine moths [*Clysia ambiguella* and *Polychrosis botrana*]. Nosprasit [loc. cit.] cannot be generally recommended on account of its tendency to cause burning. Kurtakol (1·5 to 2 per cent.) has been used at the Geisenheim Experiment Station [ibid., vi, p. 393], but in Germany, as in Austria, this preparation is too expensive for general purposes. German spraying and dusting appliances are stated to be of first-rate quality, simply constructed, easily manipulated, and economical in use.

RAVAZ (L.). **Chronique : Le temps.—Orages.—Grêle.—Rot Blanc.** [Current events : The weather, storms, hail, white rot.]—*Prog. Agric. et Vitic.*, lxxxviii, 35, pp. 197–198, 1927.

Attention is called to the fact that if hail strikes vines on which the fruit is ripening, it conduces, especially in wet weather, to the disease known as white rot or conio (coître in Switzerland), due to *Coniothyrium diplodiella* [*R.A.M.*, iv, p. 140]. Insurance com-

panies are stated to have accepted the view that injury caused to vines by white rot should be included in hail damage.

Copious copper dusting of the fruit clusters immediately after the hail-storm is advised.

[UPPAL (B. N.).] **Control of the powdery mildew of Grape.**—*Bombay Dept. of Agric. Leaflet* 6, 4 pp., 1927.

A brief, popular account is given of powdery mildew [*Uncinula necator*], the most destructive and widespread disease of vines in the Bombay Presidency [*R.A.M.*, iii, p. 446]. The results of recent experiments (1926–7) in the Deccan show that dusting with sulphur gives much better control of this disease and is also more economical than spraying with Bordeaux mixture. The first application should be given when the new shoots are 6 to 8 inches long; the second just before or at the commencement of blossoming; the third about six weeks later; and the fourth (where necessary) a month after the third. The present cost of sulphur locally is about Rs. 8 [12 shillings] per cwt. Of the two dusting machines readily available to Bombay growers, the Savage (D. B. Smith & Co., Utica, N.Y.) is stated to be superior to the Torpille (W. Weeks & Son, Ltd., Maidstone). The cost of the former apparatus is about Rs. 50 [£3 15*s.*] and that of the latter Rs. 28 [£2 2*s.*].

Notes sur les travaux poursuivis par les stations et laboratoires de l'Institut des Recherches Agronomiques en 1926. [Notes on the activities pursued at the stations and laboratories of the Institute of Agricultural Research in 1926.]—*Ann. Sci. Agron.*, xliv, 2–3, pp. 108–239, 1927.

This report contains, *inter alia*, a full account of the phytopathological work carried out during 1926 at the various branches of the French Institute of Agricultural Research. The separate items have already been noticed in this *Review* from other sources.

Work connected with insect and fungus pests and their control. —*Rept. Agric. Dept., St. Vincent, for the year 1926*, pp. 9–14, 1927.

This report contains the following references of phytopathological interest. Cotton was attacked by soft rot (*Sclerotium rolfsii*) and West Indian leaf mildew (*Ovulariopsis gossypii*). Root disease of sugar-cane was most prevalent in fields of low fertility. The rind fungus (*Melanconium sacchari*) and pineapple disease (*Thielaviopsis paradoxa*) were also reported on this crop.

Thirty-ninth Annual Report of the Kentucky Agricultural Experiment Station for the year 1926, 33 pp., 1927.

This report contains (pp. 7, 14) the following references of phytopathological interest in addition to those already noted from other sources. Frenching of Turkish tobacco plants [*R.A.M.*, vi, p. 132] was experimentally produced under greenhouse conditions by forcing terminal growth more rapidly than can be coped with by the nitrogen intake from the soil. In pot cultures the disease was thus induced in virgin soil rich in organic matter, in old cultivated soil poor in organic matter, and in sand.

A form of root rot of maize which was produced by the addition of rotted maize roots to the soil has been artificially induced in plants grown in sand by mixing cultures of a large-spored species of *Pythium* with the soil. The organism was re-isolated from the lesions on the roots, and from the roots of plants inoculated with rotted maize roots from the field.

Forty-fifth Report of the Ohio Agricultural Experiment Station for 1925–26.—*Ohio Agric. Exper. Stat. Bull.* 402, 156 pp., 2 pl., 15 figs., 1 diag., 6 graphs, 6 maps, 1927.

The following references of phytopathological interest, other than those already noticed in this *Review*, occur on pp. 34–44 of this report.

Trumbull wheat proved very resistant to bunt [*Tilletia levis*] when tested by artificial inoculation, and the Fulhio variety rather less so, while the former also appears to be almost immune from loose smut [*Ustilago tritici*].

The development and activity of the apple scab fungus [*Venturia inaequalis*] were found to depend almost entirely on the weather between autumn (even before the shedding of the old infected leaves) and the following June. By studying the development of the fungus in the orchard it is possible to determine in advance when and under what conditions it will discharge its spores, and by correlating this information with the three-day weather forecasts of the United States Weather Bureau, a spray service was arranged during the spring of 1926 which proved very profitable to the growers.

An attempt to control *Bacterium pruni* by spraying with sodium silicofluoride [*R.A.M.*, vi, p. 425], with and without sulphur, proved unsuccessful.

In seed-bed treatments for the control of damping-off of conifer seedlings [ibid., v, p. 60], formaldehyde gave the best results, the percentages of seedlings damped off in three seasons being 13, 0, and 1·5, respectively, for the treated plants against 43, 90, and 22 in the controls. Sulphuric acid was much less effective and organic mercury compounds were unsatisfactory. Sodium acid fluoride and silicofluoride proved toxic to the seeds.

Streak of tomato, formerly attributed to a bacterium [*Bacillus lathyri*], was found to be due to a double mosaic [ibid., v, p. 636]. Of several thousand tomato plants inoculated with a mixture of tomato and tobacco mosaic viruses a large percentage developed streak, and the disease was also produced by inoculations with a mixture of tomato mosaic virus and the juice of apparently healthy potato leaves. No bacterium was found associated with the disease. Control measures include the destruction of solanaceous weeds, such as ground cherry [*Physalis* spp.] and horse nettle [*Solanum carolinense*]. Tomatoes should not be planted next to potatoes unless certified potatoes are used for seed.

The strain of early cabbage selected in 1922 [ibid., v, p. 473] as most resistant to yellows [*Fusarium conglutinans*] continued very resistant on soil in which ordinary commercial strains could not profitably be raised. In test plots of this variety in diseased soil

infection varied from 0 to 2·8 per cent., whilst a commercial strain showed from 14·8 to 100 per cent. diseased plants.

Early and late blights of celery (*Cercospora apii* and *Septoria apii*) are both common in Ohio; the former is seldom serious as it is confined to the leaflets and is checked by cold weather, but the latter, which affects the whole plant and persists at fairly low temperatures, is much more destructive. Spraying with Bordeaux mixture or colloidal copper gave very efficient control of both diseases, and commercial and home-made copper-lime dusts also proved satisfactory. Copper stearate was difficult to apply, and did not give good control.

HUNGERFORD (C. W.). **Plant pathology.**—*Work and Progress of the Idaho Agric. Exper. Stat. for the year ended December 31st, 1926* (*Bull.* 149), pp. 33–35, 1927.

Several lots of Bliss Triumph, Irish Cobbler, and Idaho Rural potatoes were grown in a special test to determine their productivity and freedom from virus diseases in comparison with certified seed from various localities. It was found that Idaho-certified Irish Cobblers gave higher yields and were much healthier than certified potatoes of the same variety from Minnesota. Two lots of Bliss Triumph seed, grown for several years at high altitudes and apparently free from disease, showed a high percentage of mild mosaic in this experiment [*R.A.M.*, vii, p. 50]. It appears from this and other evidence obtained of recent years that mild mosaic cannot be distinguished under the environmental conditions obtaining in many parts of Idaho. In order to be sure of freedom from this disease it is necessary to tuber-index the seed in the greenhouse [ibid., iv, pp. 236, 656] or to grow a small lot of seed in some district where the symptoms of infection are conspicuous. A much more severe type of mosaic, possibly identical with the rugose form, is easily recognizable in the later stages. Five years of isolation and constant roguing have eliminated practically all trace of leaf roll in a lot of Netted Gems which originally showed more than 20 per cent. infection.

None of the twenty compounds tested for the control of wheat bunt [*Tilletia tritici*] proved as satisfactory as copper carbonate in respect of economy, freedom from seed injury, and facility of application. Absolute control of the smuts of hulled oats [*Ustilago avenae* and *U. levis*] was given by the application of copper carbonate (3 oz. per bushel). Serious injury resulted from the treatment of hull-less oats with formaldehyde, but this substance gave excellent control of smut and caused little damage to the hulled varieties.

The best control of *Rhizoctonia* disease of potatoes [*Corticium solani*] was given by hot formalin (1 pint to 15 galls. of water at 125° F. for four minutes) applied to presprinkled seed.

A number of the 115 bean varieties tested in two localities for resistance to dry root rot [*Fusarium martii phaseoli*] showed a high degree of resistance. Good progress has been made in the elimination of mosaic from some superior lots of Great Northern bean seed in Twin Falls County.

Teleutospores of stripe [yellow] rust of barley [*Puccinia glu-*

marum] collected on *Hordeum jubatum* and barley germinated readily at first, but with increasing age the capacity for germination is reduced.

The following points mentioned in the report of the High Altitude Substation (pp. 44–46) are of interest. Winter wheats were severely damaged by *Helminthosporium sativum*. Three new varieties of winter wheat developed at the Moscow Experiment Station have shown an extremely high degree of resistance to bunt, which occurred in a very severe form in the upper Snake district in 1926.

Botany.—*Fortieth Ann. Rept. Pennsylvania Agric. Exper. Stat. for the fiscal year ending June 30, 1927* (*Bull.* 213), pp. 14–16, 1927.

In the section dealing with botany it is stated that *Bacillus amylovorus* [*R.A.M.*, vi, pp. 234, 302] migrates in pear and quince tissue as zoogloeal strands, exactly as in apple tissue, and that the encysted condition of the bacteria in the cells of the pear canker tissue appears identical with that in apple canker tissue; the bacteria, with some of the supporting matrix of the zoogloea, enter through fairly large openings in the cell walls of the pear. Migration of the bacteria through leaf tissue in the apple is by the typical zoogloeal strand, which passes through the intercellular spaces of the mesophyll tissue. When the bacteria reach the petiole the path of migration is in the cortex.

Fusarium wilt or stem rot of potatoes [*F. oxysporum*] is especially severe in potatoes planted in maize stubble, or where, owing to inadequate cultivation, growth is slow. The remedy consists in crop rotation, potatoes alternating with a legume, and in improved cultural methods.

Seed tests showed that potatoes succumbed more rapidly to degeneration diseases on the limestone soils at State College, Pennsylvania, than in the two other localities tested. A large part of Pennsylvania, however, should import disease-free seed at least every other year.

Investigations into the effects of fertilizers on the resistance of lettuces grown in cold frames to *Botrytis* rot indicated that an abundance of soluble salts in the soil injures the roots and predisposes the plants to infection. Mercury compounds used in quantities not injurious to lettuce gave no control of *Botrytis*, the effects of autumn applications probably not persisting to the next spring.

Inoculations of the leaves and pods of Lima beans [*Phaseolus lunatus*] with *Bacterium vignae* showed that the first rapid spread of the bacteria in the leaves is through the large intercellular spaces of the mesophyll, while in the pods, spread occurs between the cortical cells, to a depth of 10 to 15 cells below the epidermis; facility of passage between the cells appears largely to determine the path of most rapid progress, but oxygen and food supplies may also be factors.

The chief source of *Mycogone perniciosa* in mushroom beds [ibid., vi, p. 719] was found to be the soil; sprinkling infested soil with a 1 in 25 formaldehyde solution before filling the beds is stated to

control *Mycogone* disease and improve production. Surface treatment of the beds with various disinfectants after the soil had been applied did not control the disease and often reduced the yield. Disinfection of the compost gave inconclusive results. Sulphur fumigation of mushroom houses has also proved effective against *M. perniciosa.*

Twenty-sixth Annual Report of the Bureau of Agriculture, Philippine Islands, for the fiscal year ending December 31, 1926.—95 pp., 32 pl., 1927.

The section of this report dealing with plant diseases (pp. 48–66) contains the following references of phytopathological interest other than those already noticed from different sources. The most common diseases of rice found in the provinces inspected up to the present are those caused by *Piricularia* sp., *Sclerotium oryzae*, *Rhizoctonia* sp., *Helminthosporium oryzae*, and *Phyllosticta glumarum* [*R.A.M.*, vi, p. 371].

Sugar-cane was attacked by red rot (*Colletotrichum falcatum*) in six provinces, and by mosaic and rind disease (*Melanconium sacchari*) in Balayan.

Bud rot of coco-nuts [*Phytophthora palmivora*: ibid., vi, p. 608] was reported from several provinces where a regular campaign against this disease is in progress [ibid., v, p. 640]. The total number of affected trees found in thirteen provinces in 1926 was 13,156, of which 12,143 had been destroyed at the time of writing, while 139 were treated. Other diseases observed during the period under review were stem bleeding (*Thielaviopsis* sp.) [*T. paradoxa*: ibid., vi, p. 341], occurring on 29,407 trees, of which 5,945 were treated, nut fall, and nuts without shell and meat, due either to natural sterility or to fungous infection during development.

Cacao suffered from die-back in Tanawan and Batangas; from black rot and twig canker (*P. faberi*) in Mountain Province, Cavite, and Laguna; and from witches' broom (*Colletotrichum luxificum*) in the two last-named provinces.

Litchi [*Nephelium lichi*] was attacked by pink disease (*Corticium salmonicolor*) in Pasay.

Heart rot and bunchy top of abaca [*Musa textilis*: loc. cit.] occurred only in Laguna and Tayabas. Evidence has been obtained that the gall nematode (*Heterodera radicicola*) is partially responsible for the latter condition [ibid., vi, p. 359].

The following diseases of tobacco were reported from the Cagayan Valley: *Cercospora nicotianae*, mosaic, angular leaf spot (*Bacterium angulatum*), bacterial wilt (*Bact. solanacearum*), *Fusarium* sp., *Thielavia basicola*, and stem rot (*Sclerotium rolfsii*). In addition to these, the occurrence of wildfire, shown by inoculations to be due to *Phytomonas tabaceara* E.F.S. (closely allied to *Bact. tabacum*), was recorded for the first time in the Philippines. Promising results in the control of this disease were given by the application to the seedlings of a mixture consisting of 6 per cent. copper dust and sulphur powder.

Administrative Order No. 53 regulates the importation of maguey [*Agave cantula*], sisal and its varieties [*A. rigida sisalana*], or unmanufactured products thereof from the Bahamas,

Jamaica, Porto Rico, and elsewhere, to prevent the introduction of yellow spot [ibid., vi, p. 341].

Neuvième Rapport de la Station Agronomique de la Guadeloupe. 1926–1927. [Ninth Report of the Guadeloupe Agricultural Experiment Station. 1926–1927.]—101 pp., 4 pl., 2 graphs, 1927.

The following references of phytopathological interest occur in this report (pp. 56–59). Coffee in the Sainte Rose district was attacked by *Cercospora coffeicola*, *Stilbella* [*Omphalia*] *flavida* [*R.A.M.*, v, p. 160], *Sphaerella coffeicola*, and an undetermined Ascomycete.

Burgundy mixture was found to be preferable to Bordeaux mixture for the disinfection of sugar-cane setts under all conditions, both alone and in various combinations with lysol or formalin.

Root diseases of sugar-cane are stated to be no longer of any practical importance owing to the continued improvement in the cultivation of the soil.

Riker (A. J.). **Cytological studies on crowngall tissue.**—*Amer. Journ. of Botany*, xiv, 1, pp. 25–37, 1 pl., 4 figs., 1 diag., 1927.

In continuance of his previous investigations on the relations between the crown gall organism (*Bacterium tumefaciens*) and its host [*R.A.M.*, iii, p. 386], the writer studied the cytology of inoculated tomato stems. All the living tissues which have not become lignified seem able to respond to the stimulus of the organism, but the cells of the cortex show more pronounced hypertrophy and hyperplasia than those of any other tissue. A progressive reduction in the size of the cells, nuclei, and chromosomes, and in the nucleo-cytoplasmic ratio, was observed in both gall and wound tissue as a result of repeated division, a single cell becoming divided into a number of cells. The minimum is reached about the 33rd day after inoculation and a slight rise follows. The hypertrophied cells commonly appearing in crown gall tissue resisted the stimulus to division in a marked fashion, notwithstanding the great mitotic activity of the surrounding smaller cells, where the earliest development of vascular elements often occurs. Granules were found in three cases within the parenchymatous cells; these may be bacteria but their identification by cultural methods is rendered difficult by the rarity of their occurrence and their absence from freehand sections. No definite evidence was obtained of the occurrence of nuclear division by amitosis or of the existence of more than one nucleus in any cell. A secondary thickening of the cell walls, resembling that characteristic of xylem, was detected in parts of the cortex and pith having no connexion with the cambium or with any of the vascular elements. No definite conclusion as to the cause of this phenomenon has been reached, but various possible explanations are briefly indicated. A similarity in structure seems to exist between wound tissue (callus) and crown gall tissue in the early stages. The stimulus producing the gall appears to persist indefinitely and to be comparatively diffuse, while that causing the

formation of the wound tissue disappears rapidly and is relatively localized.

MUNCIE (J. H.). **A study of crown gall caused by Pseudomonas tumefaciens on Rosaceous hosts.**—*Iowa State Coll. Journ. of Sci.*, i, 1, pp. 67–116, 4 pl., 6 graphs, 1 diag., 1926. [Received September, 1927.]

In this paper the writer considers the following aspects of the crown gall (*Pseudomonas* [*Bacterium*] *tumefaciens*) problems: the presence or absence of the causal organism in the various types of overgrowth on nursery stock; the development of non-infectious overgrowths and hairy root formations; the possibility of infection through the soil; and the possible effect of any type of overgrowth of apple and peach on the water-conducting capacity of the tree [*R.A.M.*, vi, p. 562].

Cultural studies of 196 piece-root grafted apple trees discarded at the nursery on account of overgrowths at the union showed the presence of *Bact. tumefaciens* in relatively few cases (7 out of 111 in 1924 and 16 out of 85 in 1925). The crown gall organism was isolated from 16 out of 21 trees grown on an area from which severely galled roses had been dug two years previously. Re-isolations from this lot of trees after five months in storage, when the galls had begun to decay, gave negative results, but inoculations from suspensions of the macerated galls produced typical galls on tomato plants in 15 out of 21 cases.

The abundant development of fibrous roots from an overgrowth at the union of piece-root grafted trees is not a reliable indication of crown gall infection. *Bact. tumefaciens* was recovered from only 16 out of 155 (of the same lot of 196) trees showing this type of malformation in the present investigations, while isolations from 50 one-year-old apple seedlings showing the fibrous type of hairy root uniformly failed to yield the crown gall organism [ibid., vi, p. 151]. The results of experiments in the production of similar overgrowths by mechanical means indicate that the majority of such malformations are due to excessive callus formation at the tip of the scion lip of the graft. The fibrous type also developed on seedlings grown in sterilized soil from sterilized seed.

The 'woolly knot' form of hairy root occurred on seedlings from disinfected seed grown in steamed soil when *Bact. tumefaciens* was inoculated into wounds, or when the seedlings were wounded and the soil infested with the pathogen. This type of hairy root is regarded as a symptom of crown gall, whereas the fibrous form is thought to be probably non-infectious.

Bact. tumefaciens was found to retain its virulence for considerable periods in sterilized and unsterilized soil. The organism was viable and infectious after 154 days in non-sterilized greenhouse soil rich in humus and after 122 days in clay soil.

The average reduction in the water flow through the union pieces of galled six- and twelve-months-old Wealthy, Jonathan, and Ben Davis trees was found to be 19·8, 16·7, and 35·5 per cent., respectively. The figures for two-year-old Wealthy and Salome trees were 69·7 and 21·7 per cent., respectively, and for Jonathan 47·2 per cent. Lateral roots arising from above or opposite the

gall may in some cases balance the reduction in water flow due to the obstruction. In two-year-old peach trees of four varieties, the average reduction in unit water flow caused by the gall was 82·4 per cent.

In approximately 200 galled and healthy two-year-old apple trees examined, 81 per cent. of the healthy individuals showed a perfect union of scion and stock, while in 63 per cent. of the galled trees the union was incomplete. In many of these cases the gall was a callus formation resulting from an overgrowth and not necessarily due to the presence of *Bact. tumefaciens*. The imperfect healing of the union in otherwise normal trees may cause a reduction in water flow equal to that in galled individuals. Lack of continuity between stock and scion was still evident in galled piece-root grafted trees after eight seasons in the orchard, while on trees showing overgrowths at the union when planted, the malformation persists for at least thirteen years.

Dauvergne (J.) & Weil (L.). **Le cancer expérimental du Sedum spectabile.** [Experimental cancer in *Sedum spectabile.*]—*Comptes rendus Soc. de Biol.*, xcvii, 25, pp. 815–816, 1927.

The inoculation of *Sedum spectabile* with a strain of *Bacterium tumefaciens* from the Pasteur Institute resulted in the production of greyish, irregular tumours up to 3·5 cm. in size on all the aerial organs. Similar results were obtained on *S. telephium*, *S. aizoon*, *S. album*, and *S. acre*. The strain used in the tests retained its virulence for over three years and gave positive results in every case. The inoculated plants showed no trace of lignification or fissures as in *Pelargonium* [*R.A.M.*, vi, p. 149].

Rivera (V.). **Depressioni ed esaltazioni dell'accrescimento in neoplasmi vegetali sperimentali irradiati.** [Depressions and increases of the growth rate in experimentally irradiated plant tumours.]—*Riv. di Biol.*, ix, 1, pp. 62–69, 1 fig., 1 graph, 1927.

This is a more detailed account of the writer's observations on the effect of irradiation on the rate of growth of plant tumours caused by *Bacterium tumefaciens* than that already noticed [*R.A.M.*, vi, p. 276].

Tempel (W.). **Schartigkeit, Taubheit und Schmachtkorn an Getreideähren.** [Indentation, sterility, and blighted grain in cereal ears.]—*Die Kranke Pflanze*, iv, 7–8, pp. 111–113; 9, pp. 133–135, 1927.

In the first part of this paper the writer deals with the non-parasitic causes of defective grain in cereal ears. The most important physiological factors involved in the production of indented, sterile, or blighted grain are stated to be meteorological conditions, combined with faulty methods of cultivation and selection, the effects of which are briefly discussed, with suggestions for their improvement where practicable.

The principal fungi implicated in the etiology of the same types of defects in Saxony are *Fusarium* spp. [including *Calonectria graminicola*], *Ophiobolus herpotrichus*, and *Leptosphaeria*

herpotrichoides, causing foot rot, chiefly of rye and wheat [*R.A.M.*, vii, p. 87]; flag smut of rye (*Urocystis occulta*); rusts [*Puccinia* spp.]; mildew (*Erysiphe graminis*); and *Macrophoma hennebergii* [*Septoria nodorum*: ibid., ii, p. 211], which was widespread in 1926 and 1927, producing a brown discoloration of the glumes.

SIBILIA (C.). **Esperienze di lotta contro le ruggini del Grano con polverizzazioni di zolfo.** [Experiments on the control of Wheat rusts by sulphur dustings.]—*Boll. R. Staz. Pat. Veg.*, N.S., vii, pp. 364-366, 1927.

During 1927, when local weather conditions favoured infection, experiments were continued at Anagni [*R.A.M.*, v, p. 726] on the use of sulphur dust for the control of wheat rusts [*Puccinia* spp.].

Wheat of the Gentil Rosso variety in two experimental plots was dusted with sulphur [quantity unspecified] on 30th April, 14th and 30th May, and a third plot of the same variety was similarly treated on 30th April, 8th, 16th, and 25th May. A plot of wheat of the same variety adjacent to each experimental plot remained untreated throughout all the experiments.

After the second dusting, which was given immediately rain had fallen, the wheat in the first plot retained the greenness of its leaves and was almost free from rust, while the wheat in the control was severely affected. A few days before harvesting, this treated wheat showed much better growth and colour than did the control, while the wheat in the second treated plot was slightly better developed than that in the corresponding control and showed an intensity of infection about one-third less. In the third treated plot, the wheat was equally well developed with that in the corresponding control and much superior in general appearance and colour, having an intensity of infection about one-half that of the control, which was badly affected.

Two plots of wheat of the Rieti variety were similarly dusted on 1st, 14th, and 28th May, and 4th, 17th, and 31st May, respectively. In the first plot, the development of the wheat just before harvesting approximately equalled that of the adjacent untreated control, while the intensity of infection was approximately one-half. In the second plot, the development of the wheat was slightly better than that of the control, and the intensity of infection approximately one-third less.

The author considers that under the conditions prevailing at Anagni three or four dustings, commencing immediately after the first spring showers, should give decidedly beneficial results.

TETEREVNIKOVA (Mme D. N.). Наблюденiя над биологическими видами **Puccinia graminis Pers.** [Observations on the biological races of *Puccinia graminis* Pers.]—*Morbi Plantarum*, Leningrad, xv, 4, pp. 155-175, 1926. [Received December, 1927.]

This is the full paper recording the author's observations in 1926 on the biological races of *Puccinia graminis* occurring in the neighbourhood of Leningrad, an abstract of which has already been noted [*R.A.M.*, vi, p. 718].

Aamodt (O. S.). **A study of growth habit and rust reaction in crosses between Marquis, Kota, and Kanred Wheats.**—*Phytopath.*, xvii, 9, pp. 573–609, 2 figs., 1927.

The author conducted experiments on inherited growth habit and resistance to black stem rust [*Puccinia graminis*: *R.A.M.*, iv, p. 727; vii, p. 79] with various crosses of Marquis, Kota, Kanred, and Hybrid No. 1410 wheats. Greenhouse studies were made on seedlings inoculated with uredospore cultures of known physiologic forms of *P. graminis*, and field studies on plants sprayed with uredospore suspensions.

Studies on a large number of lines in the F_3 and F_7 generations from a cross between Marquis and Kanred wheats showed that immunity from the tested forms of stem rust, from which Kanred is immune, is governed by a single genetic factor. It was also found, from the reaction of seedlings to physiologic form 1 of *P. graminis* in crosses between Kota and Kanred, that the factor for moderate resistance in the former is allelomorphic to the factor for immunity in the latter. Immunity is dominant to susceptibility and the ratios closely approximated to that of a monohybrid. The factors for susceptibility in Marquis wheat and for moderate resistance in Kota to the same physiologic form are both allelomorphic to the factor for immunity in Kanred and also to each other. The author concludes from these results that a multiple allelomorphic series of three factors governs the reactions of Marquis, Kota, and Kanred to physiologic form 1, the Kanred factor resulting in immunity, the Kota in moderate resistance, and the Marquis factor in complete susceptibility.

There was no constant relationship between the structural differences of the varieties studied and their reaction to form 1 of the rust; the reaction appears to be due to physiological causes.

Pesola (V. A.). **Kevätvehnän keltaruosteenkestävyydesta.** [On the resistance of spring Wheat to yellow rust.]—*Publ. Agric. Res. Finland*, 8, 199 pp., 1 col. pl., 33 figs., 7 graphs, 15 diags., 1927. [English abstract.]

The investigations and experiments fully described in this paper were carried out from 1921 to 1925 near Helsingfors. Their main objects were to determine (*a*) the reaction to yellow rust (*Puccinia glumarum*) of the different varieties of spring wheat grown in southern Finland; (*b*) whether any varieties possess hereditary resistance to rust, and, if so, whether this character can be combined with other desirable qualities, especially rapid maturing; and (*c*) the extent of the losses caused by yellow rust in the districts under observation. These questions are considered throughout mainly from the plant breeder's standpoint.

Details are given concerning the conditions and methods of investigation. The seed was sown in parallel plots of 20 sq. m. at an average rate of 270 kg. per hect. The degree of intensity of the rust infection was estimated by the scale used by the Association of Northern Agricultural Investigators, in which the number 1 is assigned to the most severe form of attack (leaves completely yellow) and 10 to those entirely free from discoloration.

the intermediate numbers being applied to the transitional grades. The material used in the test comprised 227 varieties and lines of spring wheat.

The results of the experiments [which are tabulated and discussed] showed marked varietal differences in reaction to rust. The remarkable constancy of these differences under varying conditions in the author's tests strongly indicates that resistance to yellow rust is due to internal, hereditary factors. On the basis of the method described above, 34 varieties and lines were placed in the very resistant group (grades 10 to 8), including Vårperl (Svalöf, I), Extra Kolben (Svalöf, I), Ahvenanmaalainen (I, III, and pedigree selection), four pedigree selections of Westermarck, and selections of Marquis, Power, Red Fife, and Preston from Canada. The resistant group (grades 7·9 to 6) contains 9 varieties, the susceptible (grades 5·9 to 3·6) 20, and the very susceptible (grades 3·5 to 1·0) 5, including Prelude VIII from Canada. It was shown that the average resistance of 15 early and medium-early varieties from 1921 to 1925 was grade 3, compared with 5·7 and 8·7 for 50 medium-late and 80 late varieties, respectively. Thus there is a distinct correlation between resistance to rust and delayed maturity, but the occurrence of a few exceptions to this general rule indicates that these two biological characters may also exist independently.

A comparison of the reaction of some of the tested varieties to yellow rust in Sweden and Germany showed that an approximately equal degree of resistance or susceptibility is maintained under divergent conditions. This was particularly marked in the case of *Triticum monococcum*, which preserves its immunity or high degree of resistance in different parts of the world [*R.A.M.*, vi, p. 540].

The results of hybridization experiments involving nine different crosses are given in considerable detail and showed that when a resistant parent is used for crossing with varieties of different grades of resistance, the greater the degree of resistance of the latter, the greater will be the resistance of the F_3 progeny plots. Thus the average resistance in the F_3 generation of crosses between the very resistant Extra Kolben and the highly susceptible Prelude was 5, while the corresponding figures for crosses between Extra Kolben and Hankkijan Ruskea (susceptible) and Extra Kolben and Marquis (very resistant) were 8 and 9·4, respectively. An analysis of the rust reactions of the F_3 individuals, together with observations made on the plots of the F_4 generation, indicates that in all probability there are two factors responsible for resistance or susceptibility to yellow rust. In those F_3 plots showing a similar degree of resistance or susceptibility to either of the parent varieties, the rust factors are evidently homozygotic, every plant being affected to about the same degree, while in the intermediate ones they are heterozygotic, the individual plants varying greatly in their reactions.

By assuming two homomeric rust factors (A and B) acting cumulatively, and supposing the heterozygous to be intermediate, five different degrees of rust resistance (AA BB, AA Bb, AA bb, Aa bb, and aa bb) will be given, of which $\frac{1}{16}$ of the plants will

belong to each of the first and last groups, $\frac{4}{16}$ to the second and fourth, and $\frac{6}{16}$ to the third. Discrepant results in other countries may be due to the existence of different biologic forms of the rust.

A consideration of the relations between the duration of growth and rust resistance, in the progeny of some of the above-mentioned crosses, indicates that these characters are due to factors which are inherited independently of one another. It should, therefore, be possible to unite them in the same spring wheat, and the author's preliminary experiments in this direction [details of which are given] have yielded promising results from a practical standpoint.

The degree of resistance or susceptibility to yellow rust in spring wheat was not found to be essentially influenced by the time of sowing.

It was shown that in the cross between Extra Kolben and Prelude, yellow rust reduced the crop by 44·8 to 47·4 per cent., the corresponding figure for that between Marquis and Hankkijan Ruskea being 23·6 to 34·6 per cent. Yellow rust causes a diminution in the weight of the kernels and in the number of the grains, while the yield of straw and the weight of the roots are also reduced by the disease. An experiment in which the leaves of rust-resistant wheat were clipped off at the time of heading showed that the yield of grain is thereby reduced by 20 to 30 per cent. Rust can cause further losses (50 per cent. or more) by the deterioration of assimilation due to the infection of the sheath and glumes; by direct injury to the grain; and by the weakening of the root development through infection of the seed in the preceding crop.

ALABOUVETTE & MENERET. **A propos d'un Æcidium sur Thalictrum minus.** [Notes on an *Aecidium* on *Thalictrum minus.*] —*Rev. Path. Vég. et Ent. Agric.,* xiv, 3, pp. 191–192, 1927.

Aecidiospores from *Thalictrum minus* near Clermont-Ferrand were sown on varieties of *Triticum vulgare* and on *T. dicoccum dicoccoides,* and on three occasions gave rise on this last host, 11 or 12 days after inoculation, to uredosori agreeing with those of *Puccinia triticina.*

FLEROFF (B. K.). **Некоторые новые направления в изучении головневых грибов.** [Some new tendencies in the study of smut fungi.]—*Morbi Plantarum,* Leningrad, xv, 2, pp. 87–92, 1926. [Received December, 1927.]

The author points out the great progress achieved of recent years in the study of smut fungi, which, besides their economic importance, are of the greatest interest from a purely theoretical point of view, chiefly because, although highly specialized parasites, they can be induced to grow, and even apparently to go through the whole cycle of their development, on artificial media. However, he does not incline towards identifying the spores that arise in culture with those that are produced on plants in nature, since, according to his observations, no fusion of the nuclei occurs in the former. The term 'chlamydospores', in his opinion, should be applied only to those

spores of the smuts that are formed in culture, as they are more or less analogous to the chlamydospores in other fungi; the usual (sexual) spores that are formed on plants should be given some other name, e. g., 'smut spores'.

In reviewing the literature on this subject [most of which has been noticed in this *Review*], it is stated that the cytological part of the work has been fully elaborated, and that further progress is hardly to be expected in this direction, the more so since the nuclei in smut fungi are of such small size that observations on them are very difficult and, in some cases, not very convincing. A much wider field for further work is presented by the investigation of the occurrence of biological races or strains in smut fungi, and of their heterothallism, particular attention in this direction being drawn, amongst others, to the author's own paper on *Ustilago avenae* [*R.A.M.*, ii, p. 587], and to those of Liro on the Ustilaginaceae of Finland [ibid., iii, p. 368] and Bauch on *U. bromivora* and *U. grandis* [ibid., iv, p. 499].

DICKINSON (S.). **Experiments on the physiology and genetics of the smut fungi.—Seedling infection.**—*Proc. Roy. Soc., London*, Ser. B, cii, B. 715, pp. 174–176, 1927.

In continuation of his previous investigations [*R.A.M.*, vi, p. 309], the author describes experiments in which combinations of genders of the oat smut (*Ustilago levis*) were used in the inoculation of oat seedlings. A small piece of mycelium from the edge of a 7- to 10-days-old culture was rubbed over the surface of the coleoptile (5 to 10 mm. long) with a platinum needle. Sterile distilled water was added and also the second inoculum when required, without drying. After two days the seedlings were stained in lactophenol and cotton blue and examined microscopically. The results [which are tabulated] show that when 76 seedlings were inoculated with a sporidial culture of A gender, 24 seedlings inoculated twice with A gender, 56 once with one of B, and 25 twice with B gender, respectively, no infection was obtained. Of 204 seedlings inoculated with both genders (A and B), 186, or 91 per cent., became infected. When two genders were present, infection occurred whether the two genders were of the same species, *U. levis*, or of the two different species, *U. levis* and *U. hordei*. Pure oat smut did not infect barley seedlings, and pure barley smut did not infect oat seedlings. There is every indication that the infecting hyphae are 'fusion hyphae', though the cytological evidence on this point is not yet complete.

MILAN (A.). **Infezione per 'Tilletia' su Grano in via di accestimento. (Nota preventiva.)** [Infection of earing Wheat by *Tilletia*. (Preliminary note).]—*Nuovo Giorn. Bot. Ital.*, N.S., xxxiv, 3, pp. 630–631, 1927.

It is generally assumed that the only period at which wheat is liable to infection by *Tilletia tritici* and *T. levis* is during the early stages of germination, when the coleoptile emerges from the embryonal tegument and begins to develop independently. In order to ascertain the possibilities of any other mode of infection, the writer in 1925 wounded the stem bases of a number of Gentil

Rosso wheat seedlings grown from sterilized seed and placed them in aqueous suspensions containing conidia and chlamydospores of the above-mentioned fungi. The positive results of this test encouraged further experiments on a larger scale, and in 1926, 415 Gentil Rosso plants from sterilized seed, each bearing on an average two to three culms in process of earing, were similarly treated. Of the 195 plants placed in the fungous suspensions, 138 or 70·7 per cent. developed bunted ears, while all the controls (grown in water) remained healthy. It is considered to be conclusively proved that infection by *T. tritici* and *T. levis* can occur on wheat plants in process of earing.

MOLZ (E.). **Zur Geschichte der Saatgut-Trockenbeize.** [On the history of seed-grain disinfection by dusting.]—*Deutsche Landw. Presse*, liv, 38, p. 520, 1927.

The history of seed-grain disinfection by dusting in Germany (where Tubeuf began his experiments with copper carbonate in 1902) and elsewhere is briefly traced. Attention is drawn to some of the more important recent work in the control of fungous diseases of cereals by dusting the seed-grain, with special reference to the official tests of the German Plant Protection Service. As a result of the trials of 1926–7 dusting with abavit B and tillantin against wheat bunt [*Tilletia tritici* and *T. levis*] and *Fusarium* [*Calonectria graminicola*] of rye and other cereals is officially recommended for general use. In addition to the various types of dusting apparatus already described in this *Review*, mention is made of the Saxonia and Saetgut machines.

VOLK (A.). **Neuere Erfahrungen mit Trockenbeizen.** [Recent experiences with dusts.]—*Beitr. zur Pflanzenzucht*, 9, pp. 42–51, 1927.

This paper deals in general terms with various aspects of dusting for the control of fungous diseases of cereals. Notices of all the work referred to have already appeared in this *Review*.

ENGLISCH (A.). **Getreidebeizversuche im Benetzungsverfahren.** [Cereal disinfection experiments by the sprinkling method.]—*Deutsche Landw. Presse*, liv, 39, p. 532, 1927.

Finding neither the liquid treatment nor dusting of seed-grain completely satisfactory in practice, the writer, in 1925, evolved a special method of sprinkling which has given excellent results in the control of wheat bunt [*Tilletia tritici* and *T. levis*] and loose smut of oats [*Ustilago avenae*]. In the first instance the seed-grain was sprinkled three times at the rate of 8 l. of water and $33\frac{1}{3}$ gm. of disinfectant (germisan, tillantin, or agfa) per 100 kg., but experiments have shown that two treatments with 30 gm. of disinfectant in 6 l. of water (8 l. for oats) per 100 kg. are quite sufficient. The seed is ready for sowing six or eight hours after treatment. This method obviates the drawbacks incidental both to immersion and dusting, and should prove specially valuable on small farms where economy of time is of primary importance.

Hoffmann (G.). **Das Germisan-Kurz-Beizverfahren.** [The germisan short disinfection process.]—*Die Kranke Pflanze*, iv, 9, pp. 143–144, 1927.

The following instructions relating to the germisan short disinfection process are issued by the Saccharinfabrik, Magdeburg. For group (1), comprising co-operative societies and large farms using specially selected or guaranteed seed, 1 cwt. of rye should be treated with 1 l. of a 1 per cent. germisan solution, wheat with 1 l. of a 1·5 per cent. solution, and barley with 1·5 l. of a 2 per cent. solution. The corresponding figures for group (2), consisting of small farms or companies which use ordinary unselected seed, are as follows: for rye, 1·5 l. of a 1 per cent. solution; wheat, 1·5 l. of a 2 per cent. solution; and barley 2 l. of a 2 per cent. solution. The seed-grain is mixed for three minutes (or five in the case of barley) in one of the standard dusting machines, e. g., Puk, Lothrä, Primus B, or Ideal. A brief note is given on dusting, which is considered to entail many risks and to be suitable only for group (1).

Gram (E.). **Vintersædens Afsvampning.** [The disinfection of winter seed-grain.]—*Ugeskr. for Landmænd*, lxxii, 35, pp. 549–551, 1927.

The following directions are given for the disinfection of winter seed-grain in Denmark. German and Danish experiments have shown that the concentrations of the mercurial preparations used against wheat bunt [*Tilletia tritici* and *T. levis*] and snow mould [*Calonectria graminicola*] can be reduced without impairing their efficacy. Agfa and germisan may be used for sprinkling at the rate of 30 gm. per 12 l. (0·25 per cent.) for 100 kg. of seed-grain, while the necessary quantity of tillantin C is 45 gm. per 12 l. (0·375 per cent.). For dusting, abavit B, Magdeburg 225, 175, and 175/5, and tutan should be applied at the rate of 200 gm. per 100 kg., and germisan, tillantin C, tillantin liquid, and tillantin dry at that of 100 gm. For *C. graminicola* on rye the dusts should be applied as above, while agfa, germisan, and tillantin C should be used at the rate of 60, 45, and 30 gm. respectively, in 12 l. per 100 kg. *C. graminicola* on winter barley may be controlled by sprinkling with 0·25 per cent. germisan or tillantin, while for stripe disease [*Helminthosporium gramineum*] these preparations should be used at the rate of 60 to 75 gm. per 100 kg., and the dusts at 100 gm.

Vaupel (O.). **Kupfervitriol zur Saatgutbeize nicht geeignet.** [Copper sulphate unsuitable as a seed-grain disinfectant.]—*Die Kranke Pflanze*, iv, 7–8, pp. 113–115, 1927.

The use of copper sulphate, which proved extremely valuable in the severe epidemics of wheat bunt [*Tilletia tritici* and *T. levis*] in the 'eighties' of last century, is stated to be now almost entirely superseded in Germany by the more effective modern preparations, including germisan, kalimat B; tillantin, uspulun, and abavit B dust. Besides its well-known tendency to impair germination, copper sulphate is inferior to the above-mentioned disinfectants in its failure to control the *Fusarium* disease of rye and other cereals [*Calonectria graminicola*], stripe disease of barley [*Helminthosporium gramineum*], etc.

Koursanoff (A. L.). О влиянии **Ustilago tritici** на дыхание и испарение Пщеницы. [On the effect of *Ustilago tritici* on the respiration and transpiration of Wheat.]—*Morbi Plantarum*, Leningrad, xv, 2, pp. 57–71, 2 figs., 3 graphs, 1926. [Received December, 1927.]

A detailed description is given of experiments made in 1925 at the Botanical Gardens in Moscow with a pure line of *Triticum vulgare* var. *lutescens*, with a view to finding out the effect of loose smut (*Ustilago tritici*) on the respiration and transpiration of the host at all stages of development of the latter. Respiration tests were commenced from the moment the wheat seed grains started to swell. The results showed that at first the respiration of the healthy germinating seeds was more active than in diseased seeds; then it gradually increased in the latter, until on the fourth day it was approximately equal in both. From that time the diseased seeds began to respire more than the healthy, and on the seventh day their respiration was more active by 40 per cent. (as measured by the volume of carbon dioxide liberated) than in the latter. Then the difference declined again, until it reached a more or less constant ratio of 1 to 1·21, which was maintained during the further development of the plants until the formation of the ears. The balance of evidence indicated a slight retardation in the process of development of the infected seeds, this being substantiated by the morphological details of the developing germs during the first three days of their growth. From the ear formation stage onwards, the respiration ratio again varied in favour of the diseased plants, until it was 1 : 1·36 at the moment when the ears began to emerge. Respiration tests made with separate organs of the plants showed that while at first the respiration of healthy and infected leaves was about equal or even somewhat depressed in the latter, the ratio rapidly increased in favour of the infected, particularly towards the end of the vegetative period; the same was also true, but to a more marked degree, in regard to the leaf sheaths, while no difference was found in the respiration of the roots of normal and smutted plants.

The mycelium of the fungus, in the more advanced stages of growth of the host, is chiefly located in the stems, whence it penetrates into the ears and, to a certain degree, into the leaf sheaths; in the leaves it was rarely found, and then, usually, towards the end of the vegetative period. Hyphae were never found in the roots of seedlings over two weeks old.

It is pointed out that the difference between the respiration of healthy and diseased plants is due not so much to an absolute activation of the respiration of the latter, as to the fact that in healthy plants the respiration begins to slow down considerably at the time when the ears start to fill, while no slowing down occurs in the smutted plants until the latter begin to die off.

Preliminary experiments indicated that smutted wheat plants transpire, on the average, about 20 per cent. more water than the normal, and further experiments are in hand in an attempt to elucidate the causes of this increase. An indirect confirmation of a heightened transpiration in diseased plants is considered to be the fact, repeatedly observed by the author, that during spells of dry

weather such plants exhibit marked symptoms of wilting, while normal plants still retain their turgidity.

In conclusion, it is pointed out that no stimulating effect was found to be exerted by *U. tritici* on the growth and tillering of the variety of wheat tested. On the contrary, all parts of the infected plants were markedly stunted, the average dry weight of the aerial organs (a week after flowering) of normal plants being greater by 36 per cent. than that of smutted plants, when the ears were kept on the plants, and by 28 per cent. when the ears were cut off.

WINKELMANN (A.). **Ueber den Gersten- und Weizenflugbrand und seine Bekämpfung.** [On the loose smut of Barley and Wheat and its control.]—*Illus. Landw. Zeit.*, xlvii, 39, p. 509, 1927.

The year 1927 was characterized in all parts of Germany by severe epidemics of loose smuts of barley and wheat [*Ustilago nuda* and *U. tritici*], which is controllable only by the hot water treatment, applied as follows. The seed-grain is placed in sacks (half or three-quarters full) and soaked for four hours in a large tub containing water heated to a temperature of 25° to 30° C. The pre-soaked seed is then dipped several times in a tub containing water at 54°, and finally transferred to a third vessel for ten minutes, also at 54°. For the treatment of large quantities of seed the Appel-Gassner, Büttner, Jäger-Dix, and Degesch apparatus can be recommended [*R.A.M.*, vi, pp. 88, 89]. The hot water treatment is also generally effective in the control of stripe disease of barley [*Helminthosporium gramineum*] and wheat bunt [*Tilletia tritici* and *T. levis*], but for greater security the seed-grain should be pre-soaked in 0·125 per cent. germisan, urania, or uspulun, or in 0.1 per cent. uspulun-universal.

LEIDNER (R.). **Die Anwendung der Heisswasserbeize zur Bekämpfung des Weizen- und Gerstenflugbrandes.** [The application of the hot water treatment for the control of loose smut of Wheat and Barley.]—*Illus. Landw. Zeit.*, xlvii, 42, pp. 548–549, 1927.

The writer points out the necessity for caution in the application of the hot water treatment against the loose smuts of wheat and barley [*Ustilago tritici* and *U. nuda*: see preceding abstract]. After pre-soaking, samples of the seed-grain should be immersed for ten minutes in water maintained at temperatures of 50°, 51°, 52°, and 53° C., in order to ascertain at what point germination is impaired by the heat. In some local experiments the germination of certain varieties of winter barley was reduced from 94 to 68 per cent. by the hot water treatment.

TEDIN (O.). **Rotdödarens härjningar på Skånes Vetefält.** [The havoc caused by foot rot in the Wheat fields of Skåne.]—*Landtmannen*, x, 36, pp. 705–707, 1927.

The writer considers that the nature of the foregoing crop is the primary factor in the development of foot rot of wheat (*Ophiobolus*) [*graminis*], which has caused heavy losses in Skåne [south Sweden] during 1927. Generally speaking, the disease is most

virulent in wheat crops following wheat or barley, though cases of severe infection have also been observed after peas, potatoes, green fodder, etc. The Malmö district is remarkable for intensive cultivation of wheat, which is often grown two or three times in five years. Defective drainage seems to be an important cause of foot rot, while there is some evidence that stable manure predisposes to infection.

A brief account is also given of the strawbreaker (*Leptosphaeria*) [*herpotrichoides*], and of the so-called 'straw fusariosis' due to a species of *Fusarium* closely related to the snow mould [*Calonectria graminicola*].

Åkerman (Å.). **Några erfarenheter om rotdödarens härjningar på de Skånska Vetefälten.** [Some data concerning the ravages of foot rot in the Wheat fields of Skåne.]—*Landtmannen*, x, 37, p. 739, 1927.

The writer's observations in the Malmö and Trälleborg districts of Skåne confirm Tedin's view as to the importance of the foregoing crop in the development of foot rot of wheat (*Ophiobolus graminis*) [see preceding abstract]. Infection is generally most virulent in wheat crops following barley or wheat, the exceptions to this rule being possibly due to some soil constituent preventing the abundant reproduction of the fungus. Weather conditions also play a large part in the occurrence of foot rot, which is usually most severe after a cool, damp early summer.

Ruttle (Mabel L.) & Fraser (W. P.). **A cytological study of Puccinia coronata Cda. on Banner and Cowra 35 Oats.**—*Univ. of California Publ. in Botany*, xiv, 2, pp. 21–72, 9 pl., 1927.

The investigations described in this paper were begun at Saskatoon, Saskatchewan, and completed at Berkeley, California. Two varieties of oats were used in the studies on the cytology of crown rust (*Puccinia coronata*) [*P. lolii*], namely, the susceptible Banner and the moderately resistant Cowra 35, a selection of Ruakura from the Cowra Experiment Station, Australia. A small amount of material of the susceptible *Avena nuda* and the resistant *A. sterilis* var. Fulghum was also studied [*R.A.M.*, iv, p. 104; v, pp. 217, 418]. The strain of *P. lolii* used in the experiments was derived from aecidia collected on buckthorn (*Rhamnus cathartica*) at Saskatoon in July, 1925, a monospore culture of this strain being employed at Berkeley.

The formation of appressoria and the mode of entry of the fungus were found to take place in the same way in both types of oats [cf. ibid., vi, p. 604]. The appressoria are not infrequently lobed. On passing through the stomatal opening, the fungus forms a rounded sac which rapidly changes into a canoe-shaped vesicle in the substomatal cavity, extending parallel to the long axis of the stoma. A very narrow infecting hypha is given off from each end of this substomatal vesicle, and the latter later becomes divided by a septum near the middle. On a susceptible host the hyphae remain nearly simple, but on Cowra 35 both vesicle and hyphae may become multiseptate and form numerous fine branches.

Further development is similar on both hosts up to the penetration of the first haustorium. The binucleate haustorium mother cell is about $12\,\mu$ long. On the Banner variety the host cell is little disturbed and the simple, uninucleate haustoria attain a maximum size of $30\,\mu$: they generally function for a few days, after which they become drained and appear as empty shells. On Cowra 35 a violent reaction often takes place following penetration, resulting in the almost immediate death of both haustorium and host cell; the haustoria, which are rarely normal in appearance, attain a maximum size of $18\,\mu$, function briefly if at all, and are rarely drained.

The host tissue of Banner oats responds to the stimulus of the fungus by an increase of turgor. The nuclei migrate to the haustoria, increase somewhat in size, then contract and finally die. The plastids slowly decrease in size and eventually disappear. Numerous rounded, intracellular bodies, ranging from 3 to $18\,\mu$ in diameter, are found in infected tissues and also in the senescent tissues of healthy plants. These structures, which resemble those associated with wheat rosette [ibid., iii, p. 452], are yellowish-brown, hollow, foamy or homogenous, and are soluble in alcohol before fixation. They probably represent some disintegration product of the host cell.

The reaction of individuals of Cowra 35 was found to vary greatly, the fungus making only feeble growth on some plants while on others small uredo- and teleutosori may be produced. The cells in the neighbourhood of the dying cell containing the haustorium are also affected, and have slightly swollen walls (sometimes with definite thickenings), enlarged nuclei, and fewer plastids. Further attempts at haustorial formation may be made, and on the more susceptible plants the hyphae may remain in fair condition for a considerable time, with few dead cells though abnormal haustoria may be numerous. When uredosori are found they are almost immediately replaced by the formation of teleutospores. The latter are often less regularly two-celled than on Banner, some sori having only one-celled spores.

A detailed account is given of the formation of the uredo- and teleutosori on Banner, clavate paraphyses (apparently not previously reported in this rust) being occasionally found at the margin of the former. Under favourable conditions for infection secondary and tertiary uredospores, ordinarily followed by teleutospores, form on both leaf surfaces. The teleutospores are irregular in outline and usually bounded by sterile tissue composed of erect, parallel cells, often laterally compressed.

A bibliography of 57 titles is appended.

TAMME (C.). **Versuche mit Haferflugbrand, Ustilago avenae, mit besonderer Berücksichtigung der Infektions-, Beiz- und Immunitätsfrage.** [Experiments with loose smut of Oats, *Ustilago avenae*, with reference to the question of infection, treatment, and immunity.]—*Bot. Arch.*, xx, 1–2, pp. 43–73, 8 figs., 1927. [English summary.]

The artificial inoculation of oats with loose smut (*Ustilago avenae*) may be carried out either on the blossoms in the field or

on ripe grain in the laboratory [*R.A.M.*, v, p. 547]. The former method probably represents the best manner of obtaining infected material under approximately natural conditions, but in the technique usually adopted too many spores reach the open flower and are adversely affected by the resulting metabolic products. This drawback was avoided in a method used by the writer in 1926. About 40 mg. of fresh spore material was placed in a glass bottle with a pierced stopper into which a hypodermic syringe, without the needle, was inserted. On shaking the bottle vigorously the spores are distributed throughout it, and then a small quantity of the spore-laden air is drawn off by the syringe. This air is then ejected in the interior of an open flower, the spores reaching the stigma in a state of extremely fine distribution.

Diehl's method of inoculating the glumes [ibid., v, p. 27] not having proved satisfactory in the writer's laboratory tests, a new technique was adopted which resulted in the development of over 60 per cent. of infection. The loose spore masses filling the ears were passed through a fine sieve into a glass-stoppered bottle, which was filled with glume decoction and shaken until the spores were uniformly distributed in the solution. Two to three drops of this suspension were introduced by means of a hypodermic syringe between the glume and the kernel, the needle passing along the dorsal side of the grain from the tip to within 2 mm. of the embryo. By this means the spores are very uniformly distributed over the entire wall of the lemma. The inoculated grains were placed on Petri dishes (80 per dish) at a temperature of 20° to 22° C. and slightly moistened on the fourth, seventh, and twelfth day after inoculation. They were then allowed to dry and kept in a cool, well-ventilated room until the time for sowing. Daily microscopic examination showed that conidia were produced in abundance a day or two after inoculation, while mycelial development generally commenced on the fourth day; three weeks later the fungus had reached the stage of the resting mycelium and gemmae. The mycelium was found to retain its viability in this form for nine months. Two points are of special importance in connexion with this method: one is the supply of sufficient moisture to promote the development of the fungus without inducing the germination of the grain; while the second is the use of fresh spore material collected during the period July to September.

A number of laboratory tests [which are fully described] were carried out to determine the efficacy of various liquid and dry disinfectants in the control of loose smut. The success or failure of the preparations was judged by their capacity to destroy the mycelium or render it too weak to penetrate the epidermis of the coleoptile. Fifteen grains inoculated by the above method were used for each test. A microscopic examination was made when the seedlings had attained a length of 3 cm., by which time the course of the mycelium within the tissue could readily be traced. The best results were given by 15 minutes' immersion in 0·1 per cent. formaldehyde, while immersion for the same period in 0·24 per cent. sublimoform, sprinkling with this preparation (0·36 per cent.), and 30 minutes' immersion in 0·2 per cent. tillantin also proved very satisfactory. None of the dusts tested was com-

pletely effective, and it is considered doubtful whether their composition can be modified in such a way as to produce reliable results under the climatic conditions prevalent in Germany.

The results [which are tabulated] of susceptibility tests carried out in the field on 15 varieties of oats in 1925 and on 14 in 1926, using about 300 plants in each test, showed that in the Leipzig district v. Lochow's Gelb, Krafft's Rheinischer Gelb, and Pflug's Baltersbacher Früh are practically immune (the first-named on heavy soil). All the other varieties showed more or less infection, Gebr. Dippe's Ueberwinder and Krafft's Rheinischer Weiss being particularly susceptible. Further trials on the same lines are in progress.

SAYRE (J. D.) & THOMAS (R. C.). **New dust treatments for Oats smuts.**—*Science*, N.S., lxvi, 1713, p. 398, 1927.

In 1926 a dust consisting of one part of copper sulphate, one of mercuric chloride, and one of cresylic acid was found to be effective in the control of the smuts of oats [*Ustilago avenae* and *U. levis*]. This preparation, though costing only about half the copper sulphate-mercuric chloride dust tested in 1924 [*R.A.M.*, iv, p. 341], is yet too expensive for general use.

In view of the known efficacy of formaldehyde against smut diseases, and of the objections attaching to the liquid methods of treatment, an attempt was made to prepare this substance in a dry form by mixing 40 per cent. formaldehyde with infusorial earth or charcoal. These dusts, containing 9, 15, or 25 per cent. of 40 per cent. formaldehyde and applied at the rate of 3 oz. per bushel, reduce the incidence of infection from 47 to less than 1 per cent.

Excellent results were also obtained with iodine vapour dust, made by mixing finely ground solid iodine with infusorial earth. This dust contained 5 per cent. by weight of iodine and was applied at the same rate as the formaldehyde dust. The cost of treatment with these dusts is estimated at considerably less than 5 cents per bushel.

DUCOMET (V.). **La carie du Seigle.** [Rye bunt.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 3, pp. 193–194, 1927.

The author briefly reviews the history of the occurrences of *Tilletia secalis* in various eastern European countries, and suggests that it may be only a form of *T. tritici*, with which his colleague Schad successfully infected rye at Grignon in 1926. Further experiments are in progress, and attempts will be made to infect wheat with authentic *T. secalis* (hitherto unknown in western Europe) and with *T. tritici* artificially developed on rye.

STAHL (C. F.). **Corn stripe disease in Cuba not identical with Sugar Cane mosaic.**—*Trop. Plant Res. Foundation Bull.* 7, 12 pp., 3 pl., 1927.

Since the winter of 1924 the writer has made almost continuous observations in Cuba on a serious disease of maize hitherto believed to be identical with sugar-cane mosaic, but now shown to be distinct [see also *R.A.M.*, vi, p. 438].

The first positive result in the study of this problem was when sugar-cane mosaic was successfully transferred to maize by means of the maize aphis (*Aphis maidis*). The pattern on maize was distinctly mottled rather than striped. Repeated transfers from sugar-cane to maize and back again to sugar-cane demonstrated that the symptoms on both hosts were caused by the same transmissible disease. These data further confirm Brandes's reports [ibid., ii, p. 584].

At the same time a small planting of maize in the vicinity was observed to be severely injured by a disease in which conspicuous stripes ran the entire length of the leaves, either parallel to or radiating from the midrib. The affected plants were heavily infested with the maize leafhopper (*Peregrinus maidis*) and a small yellow leafhopper (*Cicadula maidis*). In 1925 the transference of the former insect from diseased to healthy plants grown under cover resulted in the development of the typical stripe symptoms, which are entirely distinct from the inconspicuous mottling due to sugar-cane mosaic. Generally the first visible sign of stripe disease is the appearance of small, elongated, white specks on one side of the midrib near the base of a young leaf. The specks spread out along the leaf, forming rather fine, interrupted, or almost continuous stripes. As the disease advances, the leaves become covered with slender, interrupted stripes, which under certain conditions may be coarse and conspicuous, radiating from the midrib. In some instances, the fine stripes fuse to form yellow bands on the leaves. The variation in the appearance of the symptoms sometimes seems to be due to the intensity of infection. Under the conditions prevailing during the early part of 1927, the coarse and continuous type of striping was the characteristic manifestation of the disease. All attempts to transmit maize stripe by means of the maize aphis gave negative results, and many inoculations of sugar-cane with the maize stripe virus were uniformly unsuccessful.

Maize is severely injured by stripe disease, the plants being stunted and often dying if attacked while young. Tassels are usually found and frequently a few small worthless ears. No general infestation of young maize plants with *A. maidis* has been observed in Cuba, and it is believed that sorghum and certain wild grasses are more favourable host plants for this insect than maize.

LIMBER (D. P.). **Fusarium moniliforme in relation to diseases of Corn.**—*Ohio Journ. of Sci.*, xxvii, 5, pp. 232–246, 2 pl., 1927.

After a brief review of some of the more important literature on the diseases of maize associated with *Fusarium moniliforme* [*Gibberella moniliformis*], the writer describes his experimental work, carried out at the Ohio State University in 1923, to ascertain various important facts in connexion with the effects and mode of infection of the fungus.

Thirteen strains of the organism were secured from different sources and monospore isolations made from five of these. All the 13 strains produced concatenate macroconidia, generally three- or

four-septate but often five-septate, the last-named measuring up to 50 or 60 μ in length. Microconidia developed profusely in old, moist cultures. On the basis of their morphological and physiological reactions the strains could be separated into at least two groups. The mycelium of the group corresponding most closely to Sheldon's description (*Seventeenth Ann. Rept. Nebraska Agric. Exper. Stat.*, p. 23, 1904) was pinkish, loosely matted, and made abundant aerial growth. The colour of the substratum ranged from greenish-blue or purple on potato dextrose agar with 2 per cent. sugar to deep plum-purple on the same with 5 per cent. sugar. The mycelium of the other group was pure white and formed a low, dense mat, and the substratum was never deeper than salmon-pink in colour. These differences confirm Sherbakoff's statement (*Phytopath.*, xii, p. 45, 1922) that the species of *Fusarium* producing concatenate conidia include several distinct organisms.

Inoculations into the internodes of maize stalks with a small cork borer resulted in the development of wide black or brown streaks in the stem tissues extending through a few internodes. The fungus was reisolated from the discoloured parts. The slight degree of infection secured by needle puncture inoculations and the failure of spore suspensions to produce infection when poured under the sheath indicate that stem infection is of a relatively mild type.

A spore suspension of *G. moniliformis* was sprayed on the wounded and unwounded kernels (just past the dough stage) of 11 ears, 10 of which gave positive results. In most of the ears the infection was restricted to between three and six kernels, and it is concluded that the general development of mould from this cause is unlikely to occur except under very damp conditions.

In a test in which seedlings were grown at soil temperatures between 15·5° and 22° C. from apparently healthy, diseased, and apparently disease-free inoculated seed, respectively, the percentages of plants with clean roots were 36, 8·6, and 24·6, respectively. The infections secured under the conditions of this experiment did not cause blighting or affect the vigour of the plants, the development of the fungus apparently not keeping pace with the growth of the root system.

A high percentage of healthy seed can be obtained in cases of light infection by ten hours' immersion in mercuric chloride (1 in 1,000) at room temperature or ten minutes at 55° C. This method was not satisfactory, however, for heavily infected seed, while the hot-water treatment was also ineffective.

The effects of soil temperature on the pathogenicity of *G. moniliformis* were investigated by means of the Wisconsin temperature tanks [*R.A.M.*, ii, p. 136; iv, p 50]. It was found that most of the rotting caused by the fungus occurs at temperatures above 20°, while serious injury was restricted to the plants grown at 28° and 32°. *G. moniliformis*, which was found to be more virulent in sterile soil, was reisolated from the diseased tissues in nearly every instance. The results of these studies forcibly suggest that the death or survival of infected plants depends on the rapidity of the fungus in destroying the temporary root system before the permanent roots begin to function.

Buchheim (A. N.) & Schmaneff (M. N.). К вопросу о влиянии головни на развитие Проса. [On the question of the effect of smut on the development of Millet.]—*Morbi Plantarum*. Leningrad, xv, 1, pp. 42–46, 1926. [German summary. Received December, 1927.]

After a very brief reference to the existing literature on the question of the effect exercised by smut fungi on the growth of their hosts, the authors describe the preliminary results obtained by them in 1925 in a series of experiments carried out to test the influence of smut [*Ustilago panici-miliacei*] on the development of millet [*Panicum miliaceum*]. It was found that the fungus greatly stimulated the development in infected plants of tillers and of axillary buds, the figures being 29·84 per cent. (of the total number of plants per plot) of plants with tillers and 73·4 per cent. of plants with developed axillary buds in infected. as against 3·93 and 20·2 per cent., respectively, in the healthy plots. The smutted plants also bore a larger number of leaves (average 9·48) than the healthy ones (7·92). The average height of the smutted plants was, however, reduced to 41·94 cm. as against 49·2 cm. in healthy plants, while the average dry weight of a smutted stem was increased to 3·29 gm. as against 2·89 gm. for healthy stems. It is pointed out that these figures need confirmation, since great variations occurred from plot to plot, a circumstance possibly due to environmental conditions and to the fact that the experiments were not made with a pure line of seed.

Petri (L.). **Ricerche sulle cause del mal secco dei Limoni in provincia di Messina e sui mezzi per combatterlo.** [Researches into the causes of 'mal secco' of Lemon trees in the Province of Messina and the means of controlling it.]—*Boll. R. Staz. Pat. Veg.*, N.S., vii, pp. 229–284, 13 figs., 3 diags., 1927.

This article describes in detail the investigations into the 'mal secco' disease of lemon trees, which for the past eight years has continually increased its ravages in the vicinity of Messina, carried out by the author and his colleagues [*R.A.M.*, vi, p. 723]. He considers that the immediate cause of the disease is *Colletotrichum gloeosporioides*, but that the fact that attempts to produce the symptoms by inoculations with this fungus in Florence failed, indicates that there are local predisposing causes in the affected region. The form of *C. gloeosporioides* concerned presents a great similarity to *Gloeosporium limetticolum* in that setae are not regularly produced in the acervuli and often are completely absent, but the two species can be differentiated by their cultural characters. Perithecia of the cause of mal secco were obtained in culture, but the author hesitates to refer them to *Glomerella cingulata* in view of the differences in dimensions of the perithecia and ascospores. The form observed by him had round perithecia, measuring 120 to 180 μ in diameter, and its ascospores were 18 to 21 by 6 μ. The form of the organism which attacks orange twigs at Francavilla near Messina differs from that associated with mal secco in that the conidia of the former are lacking in red pigmentation and are much larger than those of the latter.

The pronounced severity of the attacks in Messina is believed to be related to a deficiency of lime in the soil, to the continual application of ammonium sulphate, and to the high relative humidity and generally favourable temperatures (15° to 18° C.) of the locality.

The control measures recommended consist in the application to the soil of from 2 to 5 kg. of slaked lime per tree. Treatment with ammonium sulphate should be completed by applications of mineral superphosphate, potassium sulphate, and stable manure, or other organic nitrogenous material. The slaked lime should be applied before the appearance of the disease, and the other soil treatments made between autumn and winter. In poor soils, treatment should be given twice annually.

Suggestions are also made for the treatment with fungicides of trees exposed to infection, but it does not appear that the experiments in this direction have, as yet, given definite results.

Dufrénoy (J.). **Dépérissement des rameaux de Cédratiers attaqués par le Colletotrichum gloeosporioides en Corse.** [The dying back of branches of Citron attacked by *Colletotrichum gloeosporioides* in Corsica.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 3, p. 215, 6 figs. (on p. 216), 1927.

The author has observed *Colletotrichum gloeosporioides* [*Glomerella cingulata*] attacking living branches of citron trees weakened through various causes in Corsica. As in the similar disease on lemons in Sicily [see preceding abstract] the condition is considered to be an example of hadromycosis [see below, p. 179].

Fawcett (H. S.). **Contact decay in Lemon fruits.**—*California Citrograph*, xii, 12, p. 432, 1927.

The most prevalent contact rots (rots that can spread from diseased to sound fruits) of lemons in California [which are briefly described] are blue contact mould (*Penicillium italicum*), usually the most important, brown rot (*Pythiacystis* [*Phytophthora*] *citrophthora*), sour rot (*Oospora citri-aurantii*), cottony rot (*Sclerotinia libertiana*) [*S. sclerotiorum*], and grey rot (*Botrytis cinerea*). Directions for the control of these diseases are indicated. For blue contact mould, borax is stated to be of little value [cf. *R.A.M.*, v, p. 668], and control, as in the case of sour rot, mainly consists in rejecting before storage any fruit showing injured tissue.

Sour rot often accompanies and aggravates other rots; inoculation experiments at storage temperatures recently made by the author and Savastano showed that a mixture of the sour rot and grey mould organisms produced a higher rate of decay than the sum of the rates of decay of the two fungi alone.

If any of the contact rots begin to develop rapidly in storage, the boxes should be examined, decayed fruit eliminated, and the 'contacts' either segregated to determine whether decay will occur later or discarded as culls. A stick with a projecting nail is often used to remove rotted fruits without touching them with the hands.

BUNTING (B.), EATON (B. J.), & GEORGI (C. D. V.). **The Oil Palm in Malaya.**—*Malayan Agric. Journ.*, xv, 9–10, pp. 297–386, 26 pl., 1 map, 1927.

In the section of this paper (pp. 334–342) dealing with the diseases and pests of the oil palm (*Elaeis guineensis*), brief descriptive notes are given on the following, together with suggestions for control. Bud rot of mature palms [*R.A.M.*, iv, p. 414; v, p. 79] was for some years a prominent disease in Malaya, destroying several groups of six to twelve palms annually on one estate. In spite of the removal of the diseased individuals the situation did not improve, but rapid and complete recovery was effected by cleaning out the infected tissue and placing a quantity of common salt or copper sulphate in the cavity. For several years bud rot has occurred in such a mild form that no special treatment is considered necessary.

Crown disease [see next abstract and loc. cit.] may be observed five or six months after planting in the field and is characterized in part by a water-soaked area, 3 or 4 inches long, found at the base of the young, affected leaves. So far, the total extent of the damage is the retardation for about a year of the growth of diseased palms. Crown disease has been attributed to an excess of nitrogenous food material in the soil, but this explanation seems doubtful in view of its occurrence on all types of soil in Malaya.

No further cases of infection of the fruit bunches by *Marasmius* [*R.A.M.*, v, p. 79] have been reported since the excision of the diseased material.

The non-pollinated bunches of five-year-old bearing palms were found to be attacked on one estate by a fungus belonging to the Agaricaceae, which apparently caused the disintegration of the fruits. The male inflorescence, which only persists for a few days, also frequently becomes covered with fungi causing disintegration, chiefly *Fusarium* spp.

Two other affections of fruit bunches have been observed. The first consists in a premature ripening and hardening of the individual fruits, which are difficult to separate and of little use for oil production. In the second disorder the pericarp of the individual fruits becomes soft and slimy, suggesting a bacterial agency.

HEUSSER (C.). **Contribution to the study of the crown disease of the Oilpalm (Elaeis guineensis Jacq.).**—*Commun. Gen. Exper. Stat. A.V.R.O.S.*, Gen. Ser. 31, 34 pp., 17 figs., 1 diag., 1927.

The results of the writer's studies, commenced in 1921, of the crown disease of the oil palm (*Elaeis guineensis*) in Sumatra [*R.A.M.*, iii, p. 190; v, p. 653; and last abstract] are fully described and tabulated. Cases of this disease occur irregularly distributed throughout the plantations, chiefly on plants two or three years old. In the initial stages, the young leaves remain unopened until they are nearly full grown, and three or four form a spike-like column on which dark brown or black patches develop. Rotting occurs in the soft tissues of the middle and upper part of the folded leaves, progressing from the exterior inwards, and when the column becomes too heavy it sags and unfolds. The rotting is then immediately checked and the attacked leaflets shrivel; in this way

leaves are formed from which the upper and middle leaflets are missing. The attack increases on succeeding columns, but sooner or later the disease decreases in virulence and normal leaves are formed again. No case has been known of a palm being killed by crown disease alone. Similar symptoms have been observed on maize and on the royal palm [*Roystonea regia*].

A feature of the disease is the slow decrease in rigidity of the leaf tissues, as a consequence of which the unfolding of the leaves is delayed. Diseased leaves are deficient in supporting tissues and the osmotic pressure of the sap is considerably lower than in healthy leaves.

The cause of the disease has not been determined but the disorder is thought to be a nutritional and physiological one due to the presence of some injurious constituent of the soil. Applications of urea to palms grown in pots resulted in the reproduction of the disease, and the author suggests that this substance may act by upsetting the nitrification process of the soil and leading to the accumulation of nitrites.

Both the application of lime and pruning of the crowns and roots caused a temporary improvement in the condition of the trees, but this was not maintained. Spraying with Bordeaux mixture gave slightly more satisfactory results. The greater severity of the disease during the rainy period is thought to be connected with nitrification in the soil.

Another physiological but rare disease in oil palms [mentioned in an appendix] is termed 'obtuseness' and affects the leaves formed during a period of six months to one year. At the most serious stage of the attack, the short, blunt leaves, with closely placed leaflets, appear to be dying, but suddenly the production of normal foliage recommences and the palms recover. In contrast to crown disease, the leaf stalks and leaflets of 'obtuse' palms are exceptionally hard and short.

ZAPROMETOFF (N. G.). **Бурая пятнистость листьев Сафлора.** [Brown leaf spot of Safflower.]—*Morbi Plantarum*, Leningrad, xv, 3, pp. 141–142, 1926. [Received December, 1927.]

With reference to Mourashkinsky's recent paper [*R.A.M.*, vi, p. 354] on the diseases of the safflower (*Carthamus tinctorius*) in Siberia, the author gives a brief description of *Ramularia carthami* n. sp., which he found in 1924 attacking the crop in Turkestan, where the latter is extensively grown for industrial purposes. The fungus forms on the leaves brown, rounded, later coalescing spots, from 3 to 6 mm. (occasionally 8 mm.) in diameter. The lower leaves are the first to be attacked. The under side of the spots is white, owing to the emergence of tufts of hyaline, simple conidiophores, from 14 to 25 μ in length and 3·5 μ broad. The conidia are hyaline, cylindrical, rounded at both ends, 1- or 2-septate (rarely 3-septate), and 14 to 25 by 3·5 to 4·5 μ (usually 4·5 μ). A Latin diagnosis of the fungus is appended.

PULSELLI (A.). **Microcera coccophila Desm. (1848).**—*Boll. R. Staz. Pat. Veg.*, N.S., vii, pp. 300–329, 13 figs., 1927.

After a brief summary of earlier investigations on entomogenous

fungi, the author states that he observed *Microcera coccophila* (the imperfect stage of *Sphaerostilbe coccophila*) [*R.A.M.*, iii, p. 579] on *Aonidia lauri* on boughs of *Laurus nobilis* near Rome in 1927. The morphological characters of *M. coccophila* in culture are described in detail. In the course of his studies the author obtained two types of red colonies on acid media, and a wine-coloured form on carrot agar, in addition to the usual white type of growth. It is suggested that these variations [which are described in detail] may be due to a form of saltation, or to the existence in nature of two types of mycelium and conidia, the relative prevalence of which might account for the variations observed.

THEILER (A.). **Die Diplodioses der Rinder und Schafe in Süd-Afrika.** [Diplodiosis of the ox and sheep in South Africa.]—*Deutsche Tierärztl. Wochenschr.*, xxxv, 25, pp. 395–399, 4 figs., 1927.

Diplodiosis, the disease which attacks cattle and sheep in South Africa after eating maize infested with *Diplodia zeae* [*R.A.M.*, v, p. 99], does not occur annually but develops especially in wet seasons between June and August, when resort is had to maize feeding. Definite proof of the causation of the disease by mouldy maize has been furnished by Mitchell in Natal. The causal organism [which is described: ibid., iii, p. 207] must be ingested in considerable quantity before symptoms of the disease appear. When the supply of infected food is stopped, the animal recovers. Attempts to transmit the disease to horses and pigs by means of infected fodder gave negative results.

DILLON WESTON (W. A. R.) & HALNAN (E. T.). **'Black spot' of eggs.**—*Poultry Sci.*, vi, 6, pp. 251–258, 5 figs., 1927.

An egg, purchased as new-laid, showed a black discoloration of the membrane and albumen which was found to be caused by a species of *Cladosporium*. Experiments at the Poultry Section of the Animal Nutrition Department, Cambridge, in which eggs were artificially contaminated with a spore emulsion of *C. herbarum*, resulted in the reproduction of the 'black spot' in nearly all cases. The fungus penetrated to the shell membrane after nine days, but the exact period is probably dependent on temperature and moisture. Examination showed that several hyphae together entered a pore on the surface cuticle of the egg and penetrated the minute air-spaces in the mammillary or inmost layer of the shell. The most favourable part of the egg for the development of the fungus was on the outer membrane over the air-space at the blunt end.

During the experiments, eggs were contaminated with other fungi, some of which, including a species of *Penicillium*, penetrated in the same manner.

Infection probably comes from the use of damp straw in nesting boxes.

DA FONSECA (O.) & LEÃO (A. E. de A.). **Sobre o granuloma coccidioidal. Formas de evolução nos tecidos, no pus dos ganglios lymphaticos e nas culturas do 'Coccidioides immitis'. Posição systematica do parasito.** [Coccidioidal granuloma. Develop-

mental forms in the tissues, the pus of lymph-glands, and in cultures of *Coccidioides immitis*. Systematic position of the parasite.]—*Bol. Inst. Brasileiro Sci.* (*Rio de Janeiro*), iii, 2, pp. 21–24, 1927. [Abs. in *Trop. Dis. Bull.*, xxv, 1, p. 25, 1928.]

European blastomycoses are stated to be entirely different from those occurring in Brazil, not only in the characters of the parasite but in the clinical features of the resulting diseases.

The fungus in the authors' case grew best between 25° and 30° C. on Sabouraud's and other media. Small, ashen-grey, smooth colonies appeared in three weeks and became covered with a cottony growth of aerial hyphae. The original elements consist of rounded cells, 5 to 80 μ in diameter and reproducing by endogenous sporulation.

The parasite proved to be identical with that discovered in the Argentine in 1890 and later described in America as *Coccidioides immitis* by Rixford and Gilchrist. The author regards it as belonging to the Protomycetaceae and closely allied to the Ascomycetes; the suggestion is made that some of these may evolve beyond the phytoparasitic stage and cause the condition known as blastomycosis in man.

Cleland (J. B.). **A case of systemic blastomycosis with the formation of a myxomatous-looking tumour-like mass.**—*Med. Journ. Australia*, xiv (I), 10, pp. 337–340, 1 fig., 1927. [Abs. in *Trop. Dis. Bull.*, xxv, 1, pp. 32–33, 1928.]

This is an account of a fatal case of blastomycosis occurring in 1915 and stated to be the first observed in Australia. A man aged 47 developed a swelling about four inches in diameter on the mid-point of the right iliac crest, which presented the clinical appearance of a sarcoma. Numerous budding yeast cells, 8 to 15 μ in diameter, were detected in the tumour. Local and general treatment proved unavailing. Cultures of the organism were not obtained and animal inoculation gave negative results.

Pollacci (G.) & Nannizzi (A.). **Sui caratteri dei generi 'Monilia' e 'Cryptococcus'.** [On the characters of the genera *Monilia* and *Cryptococcus*.]—*Atti R. Accad. Fisiocritici Siena*, Ser. X, ii, 1–3, pp. 35–43, 3 figs., 1927.

Diagnoses in Latin and Italian are given of the genera *Monilia* and *Cryptococcus*, with a discussion on the prevailing ambiguity in the classification of species of these genera. According to the writers, *Monilia* should include only those species having catenulate conidia, while those devoid of this character should be referred to *Cryptococcus*.

Zeisler (E. P.). **Monilia infection of the tongue.**—*Arch. of Dermatology*, xv, 2, pp. 171–185, 9 figs., 1927. [Abs. in *Trop. Dis. Bull.*, xxv, 1, pp. 23–24, 1928.]

Monilia [? *Candida*] *pinoyi* [*R.A.M.*, v, p. 365] was isolated from a case of exanthema of the tongue, manifested by narrow, branched, slightly raised, white lines on the dorsum and sides.

Niño (F. L.) & Puglisi (A.). **Moniliasis bucal. Su estudio clinico y micológico.** [Buccal moniliasis. Its clinical and mycological study.]—*Semana Méd.*, xxxiv, 4, pp. 222–229, 9 figs., 1927. [Abs. in *Trop. Dis. Bull.*, xxv, 1, p. 23, 1928.]

A seven-year-old girl was admitted to hospital with a history of five months' illness from a condition diagnosed as 'thrush'. Cultivation of the deposit yielded a *Monilia* [? *Candida*], believed to be a new species and named *M. buccalis.*

De Smidt (F. P. G.). **A type of Monilia in a case of suspected pulmonary tuberculosis in a European.**—*Kenya Med. Journ.*, iii, 10, pp. 272–274, 1927. [Abs. in *Trop. Dis. Bull.*, xxv, 1, p. 22, 1928.]

A new *Monilia* [? *Candida*], *M. kenyaensis,* was isolated from the sputum, which apparently did not contain the tubercle bacillus, of a patient whose condition simulated pulmonary tuberculosis. A brief morphological and biochemical account of the organism is given. Inoculation experiments on animals gave negative results.

Shaw (F. W.). **A Monilia from the respiratory tract.**—*Journ. Lab. & Clin. Med.*, xii, 10, pp. 968–972, 6 figs., 1927. [Abs. in *Trop. Dis. Bull.*, xxv, 1, p. 22, 1928.]

A species of *Monilia* [? *Candida*], considered to be new and named *M. richmondi,* was isolated from the sputum of a coloured woman suffering from a pulmonary affection suggestive of tuberculosis. The tubercle bacillus, however, was not found in the sputum by direct examination or by guinea-pig inoculation. The fungus occurred as whitish granules of matted hyphae and yeast cells in the sputum.

Duarte (J. G.). **Mycose pulmonar pelo Oidium brasiliense.** [Pulmonary mycosis due to *Oidium brasiliense.*]—*Brasil Med.*, xli, 47, pp. 131–135, 1927. [Abs. in *Trop. Dis. Bull.*, xxv, 1, p. 25, 1928.]

Oidium [? *Oospora*] *brasiliense* [*R.A.M.*, vi, p. 484] was found in the sputum of a 23-year-old man suffering from a cough with expectoration. A positive Bordet-Gengou reaction was obtained with this organism as antigen.

Jones (E. L.). **Torula infection of the naso-pharynx.**—*Southern Med. Journ.*, xx, 2, pp. 120–125, 4 figs., 1927. [Abs. in *Trop. Dis. Bull.*, xxv, 1, pp. 24–25, 1928.]

An infection causing large, destructive lesions of the nose and throat was provisionally diagnosed as of syphilitic origin, and later as lupus. However, the presence of yeast cells in the tissues and the cultivation of a yeast from the interior of the nodules present in the throat, resulted in a final diagnosis of 'torulosis'. A considerable improvement in the condition was effected by the application of the Röntgen rays in dosage to stimulate fibrous tissue formation.

NANNIZZI (A.). **Ricerche sull' origine saprofitica dei funghi delle tigne. II. Gymnoascus gypseum sp. n. forma ascofora del Sabouraudites (Achorion) gypseum (Bodin) Ota et Langeron. (Nota preventiva).** [Studies on the saprophytic origin of the ringworm fungi. II. *Gymnoascus gypseum* sp. n. the ascogenous stage of *Sabouraudites* (*Achorion*) *gypseum* (Bodin) Ota et Langeron. (Preliminary Note).]—*Atti R. Accad. Fisiocritici Siena*, Ser. X, ii, 1–3, pp. 89–97, 4 figs., 1927.

Cultures of *Achorion gypseum* on various substrata of animal origin [*R.A.M.*, v, p. 553] gave rise, at ordinary laboratory temperature, to an ascogenous stage with the characters of a *Gymnoascus.* Diagnoses of this organism, for which the name *G. gypseum* is proposed, are given in Latin and Italian.

The white, globular peridia are composed of a network of much branched, hyaline, smooth hyphae, measuring 4 to 5 μ within and 6 to 8 μ towards the exterior. The asci occupying the interior of the peridia are 7 to 8 μ in diameter and contain eight smooth, oval, hyaline ascospores, measuring 4·5 by 3 μ.

This discovery is regarded as confirming the author's views [loc. cit.] of a systematic connexion between the Dermatomycetes and the Gymnoascaceae.

CASTELLANI (A.). **Note on the occurrence of various tineae in New Orleans. With remarks on Trichophyton louisianicum.** —*New Orleans Med. & Surg. Journ.*, lxxix, 12, pp. 896–899, 3 figs., 1927. [Abs. in *Trop. Dis. Bull.*, xxv, 1, p. 28, 1928.]

Mycoses due to fungi of the genus *Epidermophyton* are stated to be extremely common in New Orleans, while *Microsporon*, *Trichophyton*, and *Achorion* infections are comparatively rare, and *Endodermophyton* absent.

Trichophyton louisianicum produces (1) a dry type of lesion on the glabrous skin associated with pityriasic desquamation, and (2) moist, crusted lesions. The biological and cultural characters of this fungus are described and contrasted with those of other species of *Trichophyton.*

HASEGAWA (M.). **Ueber die Dermatomykosen in Formosa mit besonderer Berücksichtigung ihrer Erreger.** [On the dermatomycoses occurring in Formosa, with special reference to their causal organisms.]—*Japanese Journ. of Dermatology*, xxvii, 2, pp. 1–152, 3 pl. (1 col.), 36 figs., 1927. [Japanese, with German summary.]

From 160 cases of trichophytosis, 37 of favus, and 6 of tinea imbricata the writer obtained 92, 27, and 3 cultures, respectively. The fungi were distributed as follows: *Microsporon japonicum* 42, *Trichophyton violaceum* 35, *T. coccineum* Kato 6, *T. radiolatum* 7, *T. interdigitalis* 1, and *Epidermophyton inguinale* 1 [*R.A.M.*, iv, p. 738; vi, p. 485].

Favus was found to be widely distributed among the natives of the west coast, 37 cases of favus of the head occurring among native schoolchildren. Nine were due to *Achorion schoenleini* and 18 to a species regarded as very probably new and named *A. formosensum* (or *Grubyella formosense* according to Langeron's and

Ota's classification). This organism is characterized by the production of greyish-white scales, though the typical yellow favus scales are also occasionally found. Chains of small, roundish spores, 3·5 to 4 μ in diameter, run longitudinally into the hair, extending into the part projecting beyond the follicle and deep into the bulb. Spores and septate, undulating hyphae, 3 to 4 μ wide, are present in the scutula.

On Sabouraud's medium the cultures are at first clear yellow and moist, turning brown and eventually becoming downy white. The branched, septate mycelium forms intercalary and stalked chlamydospores, chains of small spores, claviform bodies ('chandeliers faviques'), yellow bodies, and nodular organs. The fungus is readily infective on rabbits but not on mice, fowls, or monkeys.

The three cultures obtained from tinea imbricata were all infective on human skin and resembled *Endodermophyton tropicale.*

HASHIMOTO (T.), ISHIBASHI (T.), IWATAKE (H.), & OTA (M.). **Le favus en Mongolie et son champignon causal: Grubyella schönleini var. mongolica n. var.** [Favus in Mongolia and its causal fungus: *Grubyella schoenleini* var. *mongolica* n. var.]—*Japanese Journ. of Dermatology*, xxvii, 5, pp. 386–409, 16 figs., 1927. [Japanese, with French summary.]

Cultures were obtained from over 30 of the 59 cases of ringworm encountered during 1923 and 1924 in Mongolia; 22 were the same species and are considered to be a new variety (var. *mongolica* Hashimoto & Ota) of *Grubyella schoenleini* [*Achorion schoenleini*: *R.A.M.*, vi, p. 485]. The cultural characters of the organism are described. On glucose and maltose agar the cultures finally resemble *Trichophyton flavum* and *T. plicatile*, and this deviation from the normal aspect is regarded as a sufficient basis for the establishment of the new variety.

ACTON (H. W.) & MCGUIRE (C.). **Tinea cruris: its manifestations, diagnosis and treatment.**—*India Med. Gaz.*, lxii, 8, pp. 419–428, 8 pl. (2 col.), 1927.

This is a full account of the etiology, clinical manifestations, diagnosis, and treatment of tinea cruris, with observations on the cultural and morphological characters of the causal organism (*Epidermophyton inguinale*) [*R.A.M.*, iv, p. 738; vi, p. 485]. Castellani and others have held that there are several species of *Epidermophyton* involved in the causation of the disease, but the authors definitely state that all variations in culture, pleomorphism, growth rate, and lines of tension are dependent on variations in the media.

PANAYOTATOU (ANGÉLIQUE). **Sur une 'mycose' isolée de la langue d'un malade. Penicillium linguae (genre Scopulariopsis).** [On a 'mycosis' isolated from a patient's tongue. *Penicillium linguae* (genus *Scopulariopsis*).]—*Centralbl. für Bakt.*, Ab. 1 (Orig.), ci, 4–5, pp. 231–235, 6 figs., 1927.

Morphological and cultural details are given of an apparently new species of *Penicillium* (*Scopulariopsis* Bainier), isolated from a thick, dark brown, folded plaque on the tongue of a native

Egyptian boy aged two, and named *P. linguae*. Spherical or oval yeast cells were present in the scrapings, and thick, folded, downy white (later greenish and finally brown) cultures developed on Sabouraud's medium. Inoculation experiments on guinea-pigs gave negative results. A rat inoculated subcutaneously died in a few hours, and the fungus, though not found in the organs, was recultivated from the blood of the heart.

Da Fonseca (O.) & Leão (A. E. de A.). **Sobre o 'Scedosporium apiospermum', cogumelo productor de mycetomas na Italia e no Brazil.** [*Scedosporium apiospermum*, a cause of mycetoma in Italy and Brazil.]—*Bol. Inst. Brasileiro Sci.* (*Rio de Janeiro*), iii, 2, pp. 24–25, 1927. Also in *Sciencia Med.*, v, 9, pp. 536–540, 7 figs., 1927. [English summary. Abs. in *Trop. Dis. Bull.*, xxv, 1, p. 31, 1928.]

Scedosporium apiospermum Sacc., occurring in Italy and Brazil, grows readily on potato and Sabouraud's media in the form of white, cottony colonies, producing a greenish-black pigment. Three types of reproductive bodies are found: (1) pyriform conidia arising at the end of a hypha; (2) fusiform, curved spores surrounded by a thin membrane and abstricted from the hypha, and (3) intercalary or terminal chlamydospores occurring in groups of two to five. The fungus causes a mycetoma in which it produces a small number of bright yellow grains, about 3 mm. in diameter.

Gelonesi (G.). **Due nuovi parassiti del 'piede di Madura'. Studio sui micetomi della Somalia Meridionale.** [Two new parasites of Madura foot. A study of mycetomata in Southern Somaliland.]—*Ann. Med. Nav. e Colon.*, xxxiii (I), 5–6, pp. 283–308, 8 figs., 1927. [Abs. in *Trop. Dis. Bull.*, xxv, 1, pp. 31–32, 1928.]

The forms of mycetoma with white, yellow, and black granules are stated to be common in Somaliland, while the red form is absent [*R.A.M.*, vi, p. 612]. Details are given of two cases of the black type. In the first the subcutaneous fat of the connective tissue was replaced by a firm fibrous growth with small cavities or cysts containing greyish, viscid, purulent material. The causal organism, which is named *Mucor mycetomi*, gives rise to gemmae and to sporangia without a columella but with abundant black pigment.

The fungus associated with the second case was identified as a species of *Aspergillus*, with a mycelium composed of slender, slightly branching, septate hyphae with chlamydospores. Asci containing four to six ascospores with a sprinkling of black pigment were observed. It is named *A. mycetomi villabruzzii*.

Agostini (Angela). **Osservazioni intorno a due ifomiceti saprofiti dannosi ai tessuti di Canapa (Stachybotrys lobulata Berk. e Alternaria tenuis Nees).** [Observations concerning two saprophytic Hyphomycetes injurious to Hemp tissues (*Stachybotrys lobulata* Berk. and *Alternaria tenuis* Nees).]—*Atti R. Accad. Fisiocritici Siena*, Ser. X, ii, 1–3, pp. 25–33, 2 figs., 1927.

Considerable damage was caused to the hemp canvas covering of a motor-boat belonging to the Marine Biological Laboratory of

Taranto by two saprophytic fungi which were identified as *Stachybotrys lobulata* and *Alternaria tenuis*. Technical descriptions of these organisms are given in Italian, and 59 fungi known to occur on manufactured fibrous products are enumerated. The affected material was covered with a dark olive-green mould, verging on black at the seams. Attempts to destroy the organisms by repeated washing with sea water and exposure to direct sunlight proved fruitless. A protective action was exercised by a 5 per cent. solution of Marsiglia soap with subsequent immersion in a saturated solution of copper sulphate. Another suitable preservative for this purpose is a tannic extract obtained by boiling the cortex of Aleppo pine (*Pinus halepensis*), while in Japan the juice of *Diospyros kaki* (kaki-shibu), which contains a special tannin insoluble in water and alcohol, is stated to be widely used for the protection of fishing-nets, packing-bales, wooden receptacles, textiles, and the like.

THAYSEN (A. C.) & BUNKER (H. J.). **Notes on the examination of decayed papier mâché fire buckets.**—*Journ. Soc. Chem. Ind.*, xlvi, 38, p. 382 T, 1927.

The papier mâché fire buckets used at the Royal Naval Cordite Factory have been found to deteriorate very rapidly as a result of the activity of micro-organisms [unspecified]. It was shown that infection could be entirely eliminated by the use of a paste containing 1 per cent. phenol for the preparation of the brown paper serving as the raw material for the buckets, thereby extending the life of the appliances to 18 months or longer as compared with only two or three in the case of those supplied by the trade.

KELLERMANN (W.). **Wie in den Rosenhäusern von Aalsmeer die Pilzkrankheiten bekämpft werden.** [How fungous diseases are controlled in the Rose houses of Aalsmeer.]—*Gartenwelt*, xxxi, 41, pp. 623–624, 1927.

Under the humid atmospheric conditions prevailing at Aalsmeer (Holland) fungous diseases are rife in the plant nurseries. One of the most serious rose diseases is black spot [*Diplocarpon rosae*: *R.A.M.*, iv, p. 671], which devastates entire houses. Both this disease and mildew [*Sphaerotheca pannosa*] may be controlled by fumigation of the houses with sulphur vapour, generated by means of an apparatus (stated to be of English origin [? Campbell's Sulphur Vaporizer]) in which the charge of sulphur (150 gm. per 150 sq. m.) is introduced into the container through the funnel-shaped opening and heated by means of a spirit-lamp until the sulphur vaporizes. The apparatus is stated to have superseded very largely the use of sulphur dust in the Aalsmeer houses.

FOËX (E.). **Un Oïdium de l'Hortensia.** [An *Oidium* of the Hydrangea.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 3, pp. 217–223, 4 figs., 1927.

Plants of *Hydrangea hortensis* in glasshouses were infected by an *Oidium*, the morphology of which is briefly described: the author agrees with Bouwens [*R.A.M.*, vi, p. 512] that the fungus should be referred to *Erysiphe polygoni*.

Control was effected by spraying with potassium pentasulphide at a concentration of seven to ten parts per thousand.

WILSON (A.). **Preliminary report on the Gardenia bud drop.**—*Phytopath.*, xvii, 9, pp. 671–672, 1927.

The falling off of gardenia buds shortly before flowering time, known locally as 'bud drop', caused a loss of $2,000 in one nursery in the San Francisco Bay region of California in 1925.

The disease appears as a gradual discoloration of the pedicel and bud, where it develops in the extra-floral nectaries on the exterior of the calyx. The buds become discoloured and after four days to a month drop off.

A bacterium of the genus *Erwinia* [*Bacillus*] was isolated from infected buds. The rods are usually single, sometimes in pairs, and with seven peritrichiate flagella. The organism forms smooth, circular, yellowish colonies, with a milky spot in the centre when old. Inoculated into leaves and stems, infection developed only at high temperatures, but on buds it was readily obtained.

Transmission occurs by means of mealy bugs (*Pseudococcus* spp.) and ants, which infest the beds and feed at the extra-floral nectaries.

MALIYANTZ (Mme A.). Сахарная болезнь Тюльпанов. (Предварительное сообщение.) [Sugar disease of Tulips. (Preliminary communication.)]—*Morbi Plantarum*, Leningrad, xv, 1, pp. 46–48, 1926. [Received December, 1927.]

A very brief description is given of a disease of tulips which is stated to have been fairly common towards 1917 in hothouses in the neighbourhood of Leningrad, where it was noticed to recur regularly year after year. The first symptom was that a portion of the scape, usually about 10 cm. in length, acquired a water-soaked appearance and became translucent, bending over as a result of loss of turgor at that point. A few days later a crack formed on the affected portion, from which exuded drops of a light yellow liquid of the consistency of honey; in two days each scape yielded from 3 to 4 gm. of this liquid, which was found to consist of an almost pure solution of cane sugar. All the other portions of the affected plants remained normal, including the flowers. When dried, the diseased scapes did not shrink; they turned brown, remained translucent and pliable like candied peel, and their cells were found to be gorged with starch. Isolations from the diseased tissues occasionally yielded bacteria, one of which proved to be a short, slender, non-sporiferous rod; no experiments were made to establish whether or not this organism was responsible for the disease.

It is pointed out that healthy tulips normally contain fairly large amounts of glucose, which was shown to be totally absent from the diseased ones. On the other hand, the latter contained about nine times as much diastase as the former. The syrup exuded by the diseased tulips contained from 24·45 to 25·2 per cent. of pure cane sugar, and the author even suggests the possibility of taking industrial advantage of this disease as a new source of sugar.

Van Slogteren [E.]. **De bestrijding van het geelziek der Hyacinthen.** [The control of yellow rot of Hyacinths.]—*Laboratorium voor Bloembollenonderzoek te Lisse, Meded.* 25, 7 pp., August, 1926. [Received December, 1927.]

The results of the writer's experiments in the control of yellow rot of Grand Lilas hyacinths [*Pseudomonas hyacinthi*] by constant exposure to heat are discussed and presented in tabular form [*R.A.M.*, v, pp. 611, 612]. Maintenance during the summer at a temperature of 85° to 87° F. resulted in a reduction of the disease from 98 per cent. in the controls held at 70° to 50 per cent., while a further increase in temperature to between 98° and 100° from 1st to 15th September gave a good stand of healthy plants. For very severe cases it is recommended to raise the temperature to between 114° and 115°, or 118° and 119°, for 48 hours.

Van Slogteren [E.]. **De bestrijding van het geelziek der Hyacinthen.** [The control of yellow rot of Hyacinths.]—*Laboratorium voor Bloembollenonderzoek te Lisse, Meded.* 29, 12 pp., 1927.

Excellent control of yellow rot [*Pseudomonas hyacinthi*] was again obtained by the exposure of hyacinth bulbs during the period from August to October to a constant temperature of 85° to 87° F., with a rise to between 98° and 100° from 1st to 30th September [see preceding abstract]. The results of the experiments, which comprised 15 other combinations of time and temperature, are tabulated and discussed. The varieties used in these tests were Grand Maître, l'Innocence, Queen of the Blues, and Marconi.

Van Hook (J. M.). **A Botrytis disease of Ribes odorata Wendl.**—*Proc. Indiana Acad. Sci.*, xxxvi (1926), pp. 253–255, 1 fig., 1927.

For eight years the writer has studied a disease of the leaves and shoots of the golden currant or clove bush (*Ribes odorata*), caused by a species of *Botrytis* (probably a strain of *B. cinerea*).

The most conspicuous effect of the disease is the injury to the young growing shoots, which are killed back for about six inches, the tips curling downward as they wither and being covered with conidiophores. Infection appears to begin at the very tip of some terminal or lateral shoot, and to proceed downwards, killing the youngest lateral branches. When the progress of the fungus is arrested by the older, more woody tissue, the buds or lateral shoots below the point of infection develop rapidly both in length and diameter, giving a 'witches' broom' appearance to the bush.

Wedge-shaped, brown spots with purplish margins are usually formed on the leaves where the veins are destroyed, while oval or circular lesions may originate at the edge of the leaf and spread over a large area. The conidiophores of the fungus are always found on the under surface of infected leaves. Heavy defoliation occurs during seasons favourable to the development of the fungus.

Inoculation experiments on vigorous canes with an aqueous suspension of the fungus gave positive results in twelve days.

This is believed to be the first record of the occurrence of *B. cinerea* on *R. odorata*, though a similar disease of gooseberries has

been reported from England [*R.A.M.*, iii, p. 525] and the United States [ibid., iv, p. 44].

The infected plants are growing in a small valley under somewhat defective conditions of ventilation. In general the disease is less prevalent during dry summers, especially when preceded by a dry spring as in 1925 and 1926. In certain seasons almost every stem and branch are killed. The disease usually reaches its climax in July.

Notes on pathological interceptions.—*U.S. Dept. of Agric. Fed. Hort. Board, Service and Regulatory Announcements*, p. 2, 1927.

Among the pests collected from imported plants and plant products from 1st January to 31st December, 1926 (inclusive), was an ergot-like fungus, *Hypocreopsis phyllostachidis*, on bamboo from India. This disease is known to occur in Japan [on *Phyllostachys* sp.] but has apparently not hitherto been reported from India.

Esmarch (F.). **Der Stengelbrenner des Klees.** [Anthracnose of Clover.]—*Die Kranke Pflanze*, iv, 7–8, pp. 115–117, 1 fig., 1927.

A brief, popular account is given of the symptoms of clover anthracnose (*Gloeosporium caulivorum*) with special reference to Wellensiek's investigations [*R.A.M.*, vi, p. 99]. In the Dresden district the loss of fodder and seed from this disease may amount to 50 or 60 and 100 per cent., respectively. Concise directions are given for the reduction of infection by appropriate cultural measures.

Archer (W. A.). **Diseases of fruit and nut crops in the United States in 1926.**—*Plant Disease Reporter, Supplement* 52, 109 pp., 2 maps, 1927.

This report, which has been prepared on the usual lines [*R.A.M.*, vii, p. 33], contains a number of interesting items, of which the following may be mentioned.

Cedar rust (*Gymnosporangium juniperi-virginianae*) is stated to have caused more damage to apples in Nebraska than any other disease, the fruit as well as the leaves being attacked. The Arkansas, Grimes, Northwestern Greening, Stayman, and Winesap are reported to be immune.

Apples are affected by bitter rot (*Glomerella cingulata*) chiefly in the area bounded by the Ohio Valley in the north and by the Mississippi in the west. Infection is most prevalent under hot and moist conditions.

In Illinois the development of fireblight (*Bacillus amylovorus*) on apples occurred much later than usual, possibly on account of the almost complete absence of aphids during the critical period for early infection. The Black Twig, Gano, Kinnard, Lawyer, McMahon, Minkler, and Salome varieties have been found very resistant to this disease; sixteen varieties, including Arkansas Black, Delaware Red, and Winesap are resistant.

Crown gall (*Bacterium tumefaciens*) occurred, as usual, mainly

in nurseries, but in a large orchard in Missouri fully a quarter of the apple trees were found to have been killed by this disease.

Little general spread of blister canker (*Nummularia discreta*) has apparently occurred since 1920, the disease being mainly restricted to old, neglected apple trees, especially of the Ben Davis variety [ibid., vi, p. 491].

Powdery mildew of apples (*Podosphaera leucotricha*) was most severe in the western States, especially California and Washington.

A spotting of King David apples, often almost indistinguishable from bitter pit and sometimes resembling Jonathan spot, has occurred annually in the Pacific Northwest for some time past and is occasionally reported from the eastern States [ibid., v, p. 474]. A correlation has been observed between the occurrence of this disease and more or less severe aphid infestation.

Severe yellowing of the foliage of weakened apple trees was caused in Delaware by spraying with pyrox (containing copper). In eastern Ohio russeting from sprays appears to be favoured by low temperatures and damp, dull weather just previous to, and during blooming. This type of injury may be largely counteracted by the substitution of dry lime-sulphur for Bordeaux mixture at the pink bud and later applications against scab [ibid., vi, p. 561].

Living roots of apple were attacked by *Corticium galactinum*, while *C. stevensii* [ibid., vi, p. 125] caused considerable twig blight in two apple orchards in north-eastern Alabama.

Quinces were attacked by *Gymnosporangium germinale* in Maryland and elsewhere, and by a fungus believed to be identical with the causal organism of sooty blotch (*Gloeodes pomigena*) in Missouri, the latter apparently being reported for the first time.

Bacterial spot (*Bact. pruni*), which appears to be increasing in severity, was reported from all the principal peach-growing districts east of the hundredth meridian.

Little peach [ibid., iv, p. 294] has spread rapidly in Michigan since 1925, 20 per cent. of the trees being affected in one orchard.

Unsprayed seedling peaches in Georgia were attacked by frosty mildew (*Cercosporella persicae*).

Dendrophoma obscurans [ibid., iv, p. 335] occurred with exceptional severity on strawberries in Florida, Missouri, and Illinois.

Raspberries were attacked by blue stem wilt (*Verticillium alboatrum*) in New York, New Jersey, and in the San Francisco Bay region of California. In the last-named district the Columbian Purple, Ranaree, Cuthbert, and blackcap varieties were susceptible, while Syracuse was resistant.

Blackberries in North Carolina were heavily defoliated by blotch (*Cercospora rubi*), causing a loss of 15 per cent. of the crop.

In a special section of the report (contributed by H. R. Fulton) notes are given on the diseases of citrus and other sub-tropical fruits.

Avocados [*Persea gratissima*] were seriously damaged in California by *Rhizopus* sp. and in Florida by *Sphaceloma* sp.

Bacterial blight (*Bact. juglandis*) of Persian (or English) walnuts [*Juglans regia*] occurred in an epidemic form in California, causing a loss of 60 per cent., and was also reported from Delaware, Washington, and Oregon. Anthracnose (*Gnomonia leptostyla*) caused

severe defoliation of the black walnut (*J. nigra*) and butternut (*J. cinerea*) in Delaware.

BRAUN (K.). **Bericht über das Auftreten von Schädlingen und Krankheiten im Obstbau im Regierungsbezirk Stade während der Monate Juni, Juli, und August 1927.** [Report on the occurrence of orchard pests and diseases in the administrative district of Stade during the months of June, July, and August 1927.]—Reprinted from *Die Landwirtschaft*, 41, 42 (*Wochenbeil. zum Stader Tagebl.*), 2 pp., 1927.

In this survey of the orchard pests and diseases recorded in the Stade [near Hamburg] district during the inclusive period from June to August, 1927, the following references are of special interest. Bacterial blight of stone fruit (*Pseudomonas spongiosa*) [*Bacillus spongiosus*: *R.A.M.*, vi, p. 147], generally in association with bark beetles, was repeatedly observed on plums and damsons.

The spores of the bud rot fungus (*Fusarium gemmiperda*) [? *F. fructigenum*: *R.A.M.*, vi, p. 734] occurred in conjunction with a number of other organisms on the desiccated flowers of Morello cherries.

KÖCK (G.). **Ueber das Verhalten der einzelnen Apfelsorten gegenüber dem Apfelmeltau.** [On the reaction of individual Apple varieties to Apple mildew.]—*Fortschr. der Landw.*, ii, 18, pp. 585–586, 1927.

In view of the very serious damage caused in certain districts of Austria by apple mildew (*Podosphaera leucotricha*), the author has evolved a special method for the accurate observation of the different degrees of varietal resistance and susceptibility to this disease. The varieties are divided into four groups, namely, very susceptible, moderately susceptible, slightly susceptible, and immune. These categories are represented by a four-figure number forming the numerator of a fraction. In this numerator the unit occupying the place of the thousands, multiplied by ten, represents the percentage of observations in which the variety in question was found highly susceptible. Applying the same procedure to the places of the hundreds, tens, and units, the percentages of observations falling in the remaining three groups are obtained. The denominator of the fraction indicates the number of observations forming the basis for the evaluation expressed in the numerator. Thus the higher the denominator, the more reliable is the classification index. For example, the classification index 7201/7 implies that the variety in question was observed in seven places, and that it was adjudged highly susceptible in 70 per cent. of the cases, moderately so in 20 per cent., slightly susceptible in none, and immune in 10 per cent.

Among the varieties classified by this method, Bismarck, Boiken, Landsberger Reinette, Parker's Pippin, Signe Tillisch, and Winter Golden Pearmain were found to be highly susceptible; Baumann's Reinette, Cox's Orange, Cox's Pomona, Blenheim, Graham's Jubilee, Ribston Pippin, and Beauty of Boskoop are slightly susceptible; and Harbert's and Pineapple Pippin, Gravenstein, and Minister von Hammerstein occupy an intermediate position.

Perennial canker mysteries solved.—*Better Fruit*, xxii, 3, pp. 5–6, 1927.

This article reports that experiments begun in 1925 by L. Childs at the Hood River Experiment Station [Oregon] have established the woolly aphis [*Eriosoma lanigerum*] as the chief factor in the spread of the perennial canker disease of apples [*Gloeosporium perennans*: *R.A.M.*, vi, p. 361]. Calluses kept free from woolly aphis did not become infected, but 91 per cent. of those in which aphids were allowed to establish themselves developed definite infection. Cold weather favours the disease, while during the mild winter of 1925–6 almost no infection occurred, although the trees were infested with aphis.

Laboratory experiments disclosed that infection is effected through the rupture of the gall tissues brought about by the alternate thawing and freezing of the galls during a cold winter. The best control was found to consist in painting the wounds or excised cankers with a paint made by the Hood River Spray Company, containing copper, resin, and whale oil. This treatment should not cost more than $1 per tree. Bordeaux paints were found to be valueless.

Perennial canker, unlike anthracnose [*Neofabraea malicorticis*], never infects a sound limb, and never starts in a wound unless the woolly aphis is present.

Wormald (H.). **Brown rot of Apples: the need for careful picking and sorting.**—*Journ. Min. Agric.*, xxxiv, 6, pp. 552–554, 1 pl., 1927.

Brown rot (*Sclerotinia fructigena*) is stated to have been very severe in England in 1926 not only on apples and pears its usual hosts, but also on plums. The necessity of using precautions in the picking of apples was well exemplified during that year in some fruits of the James Grieve variety which, although quite sound when received from the pickers, developed the rot within two or three days, the infection in each case starting at the stalk end, where the stalk had been broken off at picking. The apples kept at a temperature approximately the same as that of the packing shed rotted completely in a few days. This also shows the need, especially in years when the disease is prevalent, of carefully grading the apples when packing, so as to eliminate all injured fruits, including those without stalks.

Wormald (H.). **Brown rot diseases of fruit trees in 1926.**—*Gard. Chron.*, lxxxii, 2125, p. 232, 1927.

Owing to unfavourable weather and the neglect of the removal of dead wood, blossom wilt (*Sclerotinia cinerea*) was very prevalent on cherry (especially Morello), plum, and apple (notably of the Lord Derby variety) trees in Kent during 1926, as was wither-tip of cherries and plums caused by the same fungus. *Prunus serrulata* was again attacked by the disease first noted in 1925 [*R.A.M.*, vi, p. 527], the causal organism agreeing with *S. cinerea*.

Kentish Red cherry trees in the Weald developed swellings on the branches, the bark lower down being brown and dead. *S. cinerea* was found in the diseased bark, and infection is considered to have

taken place through the blossoms, the bark being killed while the wood continued to convey sap to parts beyond the infected area; this caused a natural 'ringing', with a resulting hypertrophy of the tissues higher up.

S. fructigena caused much rotting of apple fruits (especially of the James Grieve variety), pear, and plum [see last abstract], and was also found on the fruit of cherry-plum (Myrobalan) and Morello cherries. On apples it can extend from the fruit into the spurs and branches and so cause cankers.

DUFRÉNOY (J. & M. L.). **Hadromycoses.**—*Ann. des Épiphyties*, xiii, 3, pp. 195–212, 2 pl., 16 figs., 1927.

After pointing out that the term 'hadromycosis' has been suggested by Pethybridge for the fungous diseases that selectively attack the woody tissues of plants, the authors in this paper give a brief outline of the diseases caused in various plants by species of *Verticillium*, with special reference to *V. dahliae*, the cause of the dying-off of fruit trees in the central region of France [*R.A.M.*, vi, p. 426]. In every case the affected trees (apricots, plums, almonds, cherries, and gooseberries) have, in certain sectors of their wood, a characteristic brown discoloration, due to the accumulation of wound gum impregnated with tannin, and a formation of tyloses in some of the vessels. The discoloured portions are permeated with a mycelium which, in culture, produces the conidiophores and microsclerotia of *Verticillium*. In apricots grafted on apricot stocks the discoloration may be observed starting from one or several rotted secondary roots, while in those grafted on plum stocks it can be traced from the roots of the latter into the wood of the graft without any interruption at the point of grafting. The secondary symptoms (chlorosis, and a brown discoloration of more or less extensive regions of the phloem tissues), which are very conspicuous in the apricot, do not usually appear in plums, and frequently plum stocks, although infected, may, after the death of the apricots grafted on them, produce healthy shoots and even fruit.

In the apricot, resistance to the disease is marked by an accentuation of the discoloration in the wood, which is considered to be a defensive reaction of the tree against invasion by the fungus, as it was observed that trees in which the discoloration is slight are more rapidly killed. Great differences in varietal susceptibility to the fungus was noted in the apricot, and it is stated that the selection of seedlings that, when grown in infected soil, do not show any symptoms of chlorosis, should be effective in giving a healthy stand. A measure of control may be attained by choosing for stocks only seedlings with healthy green foliage and without any discoloration in their wood, the same applying to the trees from which the grafts are taken.

DUFRÉNOY (J.). **Étude expérimentale des relations des Verticillium et de leur hôte.** [An experimental study of the relationship between species of *Verticillium* and their host.] —*Rev. Path. Vég. et Ent. Agric.*, xiv, 3, pp. 207–214, 8 figs., 1927.

The author substitutes 'hadromycosis' for the term 'tracheomy-

cosis' to indicate the condition caused by certain wood-inhabiting species of *Verticillium* which have a pathogenic action on the living cells of the wood parenchyma. The degree of resistance of the host to *Verticillium* attack depends on the reaction to infection of the living cells near the invaded tissues.

The author has observed that when *V. dahliae*, isolated from apricot trees [see last abstract], is inoculated on aseptically grown pea seedlings, the parenchymatous cells are penetrated through a thickening in the cell wall. In wilted melons, from which a species of *Verticillium* was obtained in pure culture, the infected living cells around the invaded vessels contain amoeboid nuclei and a well-defined chondriome. In infected but non-wilted melons the cells of the woody parenchyma become entirely emptied of their contents and develop suberized walls, in a zone around the infected vessels, thus cutting off the latter from the rest of the tissues.

DAY (L. H.). **Zinc chloride stays canker blight.**—*Better Fruit*, xxii, 3, pp. 9, 21, 1927.

The author states that, since 1922, he has experimented with a new method for the control of pear blight [*Bacillus amylovorus*: *R.A.M.*, iv, p. 174] and that, in the spring of 1927, hundreds of cankers were so treated and in nearly every case the disease was checked. Nearly all the experiments were made on Bartlett pears, and it remains to be seen whether success will follow similar treatment of varieties on which the disease forms deep-seated lesions.

The treatment consists in painting the unscraped bark with a solution made by dissolving 1 lb. dry zinc chloride in one pint of a solvent composed of 1 gall. denatured alcohol, 1 pint water, and 3 oz. concentrated hydrochloric acid. The solution is applied with a brush over an area extending 10 to 12 inches above and below the cankered part of the bark, and, as it is very penetrating, inspection cuts should be as few as possible; except on trunks, a second application usually kills the parts treated. The treatment has so far proved most successful on new cankers on large branches, trunks, and root crowns.

HOMMA (YASU). **A canker disease of Prunus mume and P. persica caused by a species of Camarosporium.**—*Bot. Mag.* (*Tokyo*), xli, 489, pp. 541–546, 1927.

Since 1921 the author has been engaged in a study of a canker of peaches and *Prunus mume* which was first observed by Prof. S. Ito at Sapporo in 1915. The first symptom on young shoots or seedlings is the appearance round a leaf scar of a long, elliptical, grey to whitish discoloured lesion, which has one to three blackish lines on its border, and bears the minute black pycnidia of the causal organism. The spots are often confluent and sometimes completely girdle the shoots. The concentric or isolated pycnidia rupture the cortex and appear like small lenticels. At the tips of the shoots the lesions are often longitudinally rugose. The shoots bear no leaves above the affected areas and gradually wither. All parts of the trunk, especially the limbs, may be affected, the diseased

areas turning blackish-brown and sometimes being much fissured. In the later stages the infected portions become soft and slightly sunken, while an exudation of yellowish-brown, semi-transparent gum is frequently observed. As in the case of the shoots, the parts above the lesions become progressively weaker, and when the base of the trunk is attacked the whole tree dies sooner or later.

The fungus was readily isolated from diseased material and found to be identical with *Camarosporium persicae* Maubl. The pycnidia are globose or depressed-globose and measure 224 to 351 by 378 to 420 μ. The light to dark brown, pyriform or ellipsoidal spores measure 14·5 to 24 by 7·8 to 12·8 μ; they are unicellular at first, but later develop one to three longitudinal and two to five transverse septa, forming mostly ten to fourteen cells. The mycelium grows in the cortical tissue and cambium as well as in the xylem.

Cultures of the fungus were grown on various media. Growth was very slow, the pycnidia taking fourteen months to arrive at maturity. Germination occurred by means of one to four germ-tubes. The results of inoculation experiments indicated that *C. persicae* is a wound parasite, the chief effects of which are experienced only in the late autumn. Under local conditions *P. mume* seems to be more susceptible than the peach. The disease can probably be controlled by the excision of infected material and the application of corrosive sublimate or copper sulphate to the wounds.

BALL (E.), MANN (C. E. T.), & STANILAND (L. N.). **Strawberry investigations at Long Ashton, II.**—*Journ. Min. Agric.*, xxxiv, 7, pp. 627–641, 7 pl., 1927.

The authors point out that Ballard's and Peren's view [*Journ. of Pomology*, iii, p. 142, 1921], that red plant disease of strawberries [*R.A.M.*, vi, p. 564] and the condition known as cauliflower disease (characterized by the very deformed and fasciated leaves of the plant, which resembles a small cauliflower when flowers are present) are both due to attack by *Aphelenchus fragariae*, was based on purely circumstantial evidence. This eelworm has since been found not only on strawberries affected with red plant or cauliflower disease, but also on normal plants, in the region of the leaf bases.

Plants affected with the disease termed 'sudden wilt' are characterized by a rapidly wilting foliage; the leaves become limp and often the whole plant dies. Sometimes the foliage dies, but small, weak lateral crowns are produced, giving rise to a small-leaf type of plant. Attack may occur at any time after early summer, and if the fruit is not completely developed it never reaches maturity. No proof has been obtained that the fungi isolated from affected plants are responsible for the condition.

The disease known as 'patch' has been frequently reported from the Tamar Valley and Southampton districts. In plants affected by this disease the crowns are numerous, but some are always dead; survivors are weak, and produce undersized, yellowish-green leaves, usually cupped, distorted, and with extremely short stalks. The plant appears flattened, its root-hold is poor, and any new roots formed are weak and few. Diseased plants usually appear in well-

defined, gradually increasing patches, but isolated plants are found with identical symptoms. The authors are of opinion that patch may be due to defective soil conditions.

A table is given in which the symptoms of these and some other obscure strawberry diseases are contrasted, and brief notes are given on methods of strawberry culture that have proved successful in assuring the healthy development of the plant.

AMOS (J.) & HATTON (R. G.). **Reversion of Black Currants. I. Symptoms and diagnosis of the disease.**—*Journ. Pomol. and Hort. Science*, vi, 3, pp. 167–183, 7 pl., 1927.

Referring to the method devised by Lees [*Ministry of Agriculture and Fisheries, Leaflet* 377, revised Feb., 1925] for identifying reversion of black currants [*R.A.M.*, vi, p. 597] by leaf characters, the authors point out that attention should be paid only to the leafy vegetative shoots situated chiefly towards the top or base of the previous year's wood, since axillary and spur leaves vary too much for purposes of diagnosis. The normal leaf characters of each variety must also be remembered.

According to Lees's method, if fewer than five sub-main veins are present on each side of the main vein in the central lobe of the leaf, reversion is present; the leaf shows reversion also if the margin on both sides of the central lobe is coarsely toothed, and if fewer than four of the teeth do not each receive a sub-main vein.

Experiments carried out by the authors [the results of which are tabulated] show that the reverted leaf tends to become narrower and smaller than the normal, and to flatten out at the base by the reduction in depth of the basal sinus, this last being probably the most constant feature of reversion. The reverted leaf is deficient in subsidiary veins, and its surface is more coarsely rugose than that of the normal leaf. After bud-breaking, reverted bushes can be detected by their yellow-green foliage.

Associated with reversion is a lengthening of the flowers, which appear almost transparent and lack the normal pubescence, the under side of the sepals being highly coloured. As a method of diagnosis, reliance on these symptoms proved experimentally inadequate.

The 'nettleheaded' growth, in which many of the lateral buds break into woody shoots, though recognized as a common symptom of reversion, is not diagnostic, for if a reverted bush is cut well back it produces ordinary straight shoots. Nettleheaded growths may also appear on healthy bushes after accidental damage.

There is an important distinction between true reversion and the non-infectious condition designated by the authors 'false reversion', in which the foliage appears reverted, but the shoots are never really diseased. In false reversion the basal leaves are deficient in sub-main veins and teeth, but as the shoot grows the more recently formed leaves tend to show a normal number of sub-main veins and teeth. In true reversion the basal leaves have five or more sub-main veins, and only the later formed leaves reveal any shortage. False reversion is generally caused by damaged growing tips, divided tips, by the forcing into growth of dormant buds, or by growth being impeded by drought.

Reversion generally leads to sterility: heavy cropping of so-called reverted bushes is usually attributable either to the fact that many bushes revert piecemeal, so that only one branch may be barren, or to the fact that bushes may bear a heavy crop and revert in the same season, but in succeeding years become barren. Sterility is not a sufficient symptom on which to base a system of roguing against this disease.

For practical purposes, all other symptoms are of secondary importance except the leaf characters, as the former are not universally attributable to reversion, do not necessarily accompany it, and are inapplicable when working with young, unfruited bushes.

A bibliography of 18 titles is appended.

DARLINGTON (C. D.). **Reversion in Black Currants: a study of the chromosome complement.**—*Journ. Pomol. and Hort. Science*, vi, 3, p. 242, 1 fig., 1927.

Examination of the chromosome complements in somatic cell divisions of cuttings of normal and reverted black currant bushes from East Malling Research Station showed that the chromosome numbers ($2n = 16$), and the complements, so far as could be determined, were the same in both cases. A pair of chromosomes with satellites occurred also in both.

The author concludes that gain or loss of a chromosome or a satellite cannot be concerned in reversion. Loss of any fraction of a chromosome, or 'point mutation', can hardly be considered as the cause of so constantly recurring a phenomenon.

ZELLER (S. M.). **Dwarf of Blackberries.**—*Phytopath.*, xvii, 9, pp. 629–648, 11 figs., 1 map, 1927.

Dwarf disease, chiefly of the Phenomenal and Logan varieties of cultivated *Rubus* [both included under Bailey's name, *R. loganobaccus*: *R.A.M.*, v, p. 236], but also affecting Cory's Thornless and Kittitany blackberries, occurs throughout the Pacific Coast States of North America wherever the Phenomenal (the most susceptible form) is grown.

Advanced stages of the disease, which the author considers distinct from other virus diseases of *Rubus*, are marked by short, stubby, very leafy canes with very short internodes. The leaflets, which are smaller, more rounded, and paler than normal, show a finely netted, uniform mottling, entirely different from that of streak, but not unlike the yellow mosaic of *R. occidentalis* [ibid., vi, p. 675]. The fruit may develop to a fair size, but the druplets easily fall apart.

As *Aphis rubiphila* and *Amphorophora rubi*, the vectors of other virus diseases of *Rubus* [ibid., vii, p. 36], are exceedingly rare west of the Cascade Mountains, transmission experiments [which are fully described] were made with various other insects. Successful transmission to loganberries was effected by means of *Capitophorus tetrarhodus* and also with mixed colonies of this aphis and *Macrosiphum dirhodum* found on *Rosa rubiginosa*. Attempts to transmit the disease by juice inoculations and by budding failed.

Preventive measures consist in securing stock from plantations free from the disease, in discouraging the cultivation of Phenomenal

berries where the loganberry is of commercial importance, and in roguing plantations affected with five per cent. or less of dwarf.

POOLE (R. F.). **A root rot of Lucretia Dewberry caused by a variety of Collybia dryophila Fr.**—*Journ. Agric. Res.*, xxxv, 5, pp. 453–464, 9 figs., 1927.

A root rot of the Lucretia dewberry (*Rubus procumbens* var. *roribaccus*), caused by a parasitic strain or variety of *Collybia dryophila*, was first reported from North Carolina in 1922, and by 1926 had become widespread, from 15 to 90 per cent. of the plants in some areas being affected.

The disease is marked by the presence of small, crowded, purplish leaves, white mycelial wefts in the bark, cambium, and medullary rays, and white or brownish rhizomorphs on dead and living parts of the roots and canes. The wood softens and decays. When plants are badly infected, wilting and death result, but sometimes they may be stunted and yield only a few berries for several seasons before death ensues.

A short description is given of the fruit body of the fungus, the spores of which are said to be faint buff, pip-shaped, smooth, and 4 to 8 μ long.

Sporophores were obtained in culture on a dewberry medium in 30 days. Artificial inoculations on healthy plants resulted in the production of typical disease symptoms in every case, and the fungus was successfully re-isolated. In the field, infection occurs largely through the cane stubs left after pruning, though the fungus can enter unwounded roots. Dissemination was found to occur by the planting of infected stock, and by pruning implements.

In some years, as in 1926, no sporophores are developed on dewberry plants in the field, and in such cases, since the root rots caused by *Armillaria mellea* and *Clitocybe parasitica* resemble that produced by *Collybia dryophila*, diagnosis can only safely be made after obtaining the sporophores in culture.

The southern blackberry (*Rubus villosus*) and the wild southern dewberry (*R. trivialis*) are also stated to be susceptible to *C. dryophila*.

STEVENS (N. E.) & BAIN (H. F.). **Storage rots of Cranberries in the 1926 crop.**—*Phytopath.*, xvii, 9, pp. 649–655, 2 charts, 1927.

Howes and McFarlin cranberries [*Vaccinium macrocarpon*] from Massachusetts, New Jersey, Wisconsin, and Oregon were dispatched under ordinary transport conditions to Chicago, where one box of each lot was opened monthly throughout the season and a peck of sound berries of each stored in the warehouse of the American Cranberry Exchange for two weeks. The percentage of spoiled berries in each sample was then determined and cultures of the organisms present in them were made [cf. *R.A.M.*, iii, p. 281; iv, p. 609; vi, p. 303]. The results are tabulated and discussed.

End rot (*Fusicoccum putrefaciens*) predominated in both varieties from each region, and, as the season progressed, its relative importance increased.

Guignardia vaccinii and a species of *Phomopsis* were found on

berries from each region, *G. vaccinii* being most abundant on those from New Jersey. *Acanthorhyncus vaccinii*, the second or third most important rot fungus of cranberry in New Jersey, was not found on berries from Massachusetts. A species of *Gloeosporium* occurred only on berries from Massachusetts and New Jersey. *Ceuthospora lunata*, a very important cause of cranberry rot in Oregon, was not found on specimens from Massachusetts or New Jersey, and only once or twice on those from Wisconsin.

A percentage of berries, progressively increasing with the advance of the season, in all the samples, spoiled without evidence of fungous infection, the amount varying with the place of origin of the fruit.

OGILVIE (L.). **The 'black tip' disease of Bananas.**—*Agric. Bull. Dept. Agric. Bermuda*, vi, 9, pp. 4–5, 1927.

Further investigations on the black tip disease of Dwarf, Chinese, or Canary bananas (*Musa cavendishii*) [*R.A.M.*, iv, p. 653] have shown that *Cercospora musarum*, first described by Ashby (*Bull. Dept. Agric. Jamaica*, N.S., ii, p. 109, 1913), is constantly associated with the typical minute, black, yellow-bordered spots on the leaves. Inoculation experiments with this organism gave positive results, *C. musarum* being re-isolated from the lesions thus produced. Control measures should include the removal of diseased material, sufficiently wide spacing (8 to 10 ft.) in fresh plantings, and, if necessary, a thorough application of Bordeaux mixture with an adhesive.

NOLLA (J. A. B.). **Mango wither-tip.**—*Journ. Dept. Agric. Porto Rico*, x, 3-4, pp. 257–258, 1 fig., 1926. [Issued September, 1927.]

In November, 1926, mango [*Mangifera indica*] trees in the grounds of the Porto Rico Experiment Station were found to be attacked by *Colletotrichum gloeosporioides* [*Glomerella cingulata*: *R.A.M.*, v, p. 109; vi, p. 288], which caused a very rapid withering of the young twigs and buds and a brown spotting of the leaves. Elongated necrotic areas developed on the tender, pinkish foliage, resulting in the rupture of the affected tissues. Infection apparently originates in and around the unopened leaf buds and extends down the shoot as far as the upper limit of the preceding growth. The affected leaves soon die and fall. The acervuli of the fungus develop freely on the surface of the withered twigs, especially on the scars left by the leaf petioles. Inoculation experiments with pure cultures of the pathogen from various parts of the host gave positive results.

CLARA (F. M.). **Anthracnose disease of Mango in the Philippines.**—*Philipp. Agric. Rev.*, xx, 2, pp. 271–273, 1927.

A brief, popular description is given of mango (*Mangifera indica*) anthracnose (*Glomerella cingulata*) [see preceding abstract] as it occurs in the Philippines [*R.A.M.*, v, p. 108]. The disease has been found by actual counts to cause up to 39 per cent. decay of the fruits in storage, while under favourable conditions an even greater loss may result. In addition to the above-mentioned fungus, the

writer detected the presence of species of *Rhizopus*, *Aspergillus*, and *Penicillium* in some rotted fruit. *G. cingulata* overwinters in a more or less active form on the dead organs of mango and other hosts, and develops afresh during the blooming period in warm weather with intermittent showers. The fungus was found causing anthracnose of *Hevea* rubber seedlings in two localities.

DUFRÉNOY (J.). **Un Phytophthora parasite du Néflier du Japon.** [A *Phytophthora* parasitic on the Loquat.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 3, pp. 201–206, 6 figs., 1927.

The author isolated a species of *Phytophthora* from the margins of trunk lesions on loquats (*Eriobotrya japonica*) at Bastia, Corsica.

In agar cultures a luxuriant growth of the fungus occurred and on carrot agar abundant oogonia with amphigynous, or very occasionally, paragynous antheridia were formed, measuring from 25 to 27 μ in diameter. The amphigynous arrangement is described as resulting from the coiling of the antheridium around the stalk of the oogonium. When young cultures on carrot agar were placed in very shallow water, the mycelium produced zoosporangia in a loose sympodium. The organism is regarded as belonging to the *P. omnivora parasitica* group, and is named *P. omnivora parasitica* forma *eriobotryae*.

WOLF (F. A.). **Pomegranate blotch.**—*Journ. Agric. Res.*, xxxv, 5, pp. 465–469, 1 pl., 1 fig., 1927.

During the summer of 1925 the author observed a disease, also reported from Texas, Alabama, and Bermuda, affecting the leaves and fruit of the pomegranate (*Punica granatum*), in parts of Florida. On the leaves the disease appears as circular or somewhat angular, brown spots from 4 to 5 mm. in diameter, with pink, translucent margins. Affected leaves are pale green, and fall prematurely. In periods of high relative humidity, the lower surface of the lesions is covered with dense brown masses of conidiophores and conidia, which are less abundant and less common on the upper surface. On the fruit, dark brown spots appear, coalescing into irregular blotches.

The conidial stage of the fungus, *Cercospora lythracearum*, is found on pomegranate foliage at all seasons in Florida. The conidiophores are 20 to 30 by 3 to 4 μ and bear filiform, clavate, sub-hyaline, 2- to 5-septate conidia, 30 to 56 by 3 to 3·5 μ in diameter; these readily germinate in water or on solid media, forming several germ-tubes.

Diseased leaves collected during August and placed on the ground were examined in October, when the areas killed by the *Cercospora* contained numerous globular, black pycnidia filled with hyaline, rod-like pycnospores, measuring 3 to 5 by 1 to 1·5 μ. All efforts to germinate these pycnospores failed, and the author considers them homologous with spermatia, especially as they were followed by the development of perithecia. The ascigerous stage is said to be an hitherto unknown species of *Mycosphaerella* and is named *M. lythracearum*, the diagnosis being given in English and Latin. The perithecia are black, epiphyllous, globose, 75 to 95 μ in diameter, immersed, with an erumpent papilla.

The asci are cylindrical, without paraphyses, 42 to 50 by 6·5 to 8 μ; the ascospores are biseriate, slightly curved, colourless, unequally bicellular, 11 to 14 by 2·7 to 3·5 μ.

Parallel cultures from conidia and ascospores on various media all remained sterile, but the relationship of the conidial and perithecial stages is supported by their occurrence in the same lesions, by the similarity between cultures from conidia and ascospores, and by the fact that a number of *Cercospora* species possess a stage belonging to the genus *Mycosphaerella*.

FILIPPOPULOS (G. K.). **Azione di alcuni composti venefici sopra la fumaggine dell' Olivo.** [The action of some toxic compounds on sooty mould of the Olive.]—*Boll. R. Staz. Pat. Veg.*, N.S., vii, pp. 330–346, 4 figs., 1927.

In attempts to isolate the causal organism of the sooty mould of the olive from Bari, the author invariably found *Alternaria tenuis* and *Cladosporium herbarum* present, and therefore concludes that this condition is not exclusively due to *Capnodium elaeophilum* [*R.A.M.*, iv, p. 358] to which it is usually attributed. Material from Taranto showed a brown mycelium in which pycnidia of the *Phoma* type occurred. On carrot agar, pycnospores obtained from this mycelium gave rise to colonies bearing *Alternaria* spores. The latter were much less regular than those of *A. tenuis*, measured 20 to 45 by 15 to 25 μ, and were followed by simple, globose, brown pycnidia, 70 to 150 by 60 to 120 μ in diameter, containing hyaline, unicellular, oblong-elliptical, homogeneous pycnospores, 2·5 to 4·75 by 2 to 2·5 μ, which exactly resembled those found on the leaves. The transformation of a conidium of the *Alternaria* type, usually one near the base of a chain, into a pycnidium was frequently observed. Peyronel suggests the name *A. fumaginoides* for the conidial, and *Phoma fumaginoides* for the pycnidial form. No technical diagnoses are given.

To determine whether Berlese's insecticidal mixture (a solution of 10 per cent. molasses and 0·2 to 0·3 per cent. sodium arsenite in water), used against the olive fly [*Dacus oleae*], favoured the development of the sooty mould, owing to the quantity of molasses it contains, cultures of *A. tenuis* on carrot agar were exposed to various concentrations of sodium arsenite and molasses, alone or together; the action on the fungus of copper sulphate, iron sulphate, uspulun, germisan, and lead arsenate was also tested. Sodium arsenite at 0·2 per cent., with or without a 10 per cent. solution of molasses, retarded or prevented the growth of the fungus. Lead arsenate had no effect up to 0·3 per cent. Germisan (cyano-mercury cresolate of sodium) prevented growth at a strength of 0·05 per cent., and uspulun (mercury chlorophenolate 30 per cent., sodium carbonate 50 per cent., sodium hydrate 20 per cent.) at 0·2 per cent. *A. fumaginoides* made no growth in 10 per cent. molasses with 0·3 per cent. sodium arsenite. As no growth of the fungus was noted in the presence of 0·5 per cent. copper sulphate, and little with 0·1 or 0·2 per cent., spraying with Bordeaux mixture against *Cycloconium oleaginum* should also have an unfavourable effect on sooty mould.

Demaree (J. B.). **Sand burn of Pecan seedlings.**—*Phytopath.*, xvii, 9, pp. 657–661, 1 pl., 1927.

The author first observed sand burn of pecan seedlings [*Carya pecan*] in a nursery in Georgia, in the summer of 1922, since when it has appeared in several other parts of that State and in Florida.

The disease, which resembles damping-off but is considered to be non-parasitic and due to overheating of the surface layers of the soil, begins by the appearance of a brown spot at or just above the soil surface, on the side of the stem exposed to the west or south-west. The underlying cortical tissues collapse, and a dark brown or black sunken area results, which spreads and frequently girdles the stem. Some days later the aerial part of the plant succumbs. The portion of the stalk below the lesions continues to send out sprouts which, if the weather is favourable, may live. If the girdling is incomplete a callus usually forms above the wound, and the plant may recover.

In a second, more severe type of sand burn, the terminal buds of seedlings are killed on reaching the hot surface layer of the soil.

To prevent this heat injury, good quality seed should be sown in early winter, so that when the hot weather arrives the plants will no longer be in a susceptible condition. Deep sandy soils should be avoided, and the nursery should not be exposed to the west.

Van Slogteren (E.). **Het steriliseren van de grond door middel van stoom.** [Soil sterilization by means of steam.]—*Laboratorium voor Bloembollenonderzoek te Lisse, Meded.* 26, 11 pp., 6 figs., August, 1926. [Received December, 1927.]

An account is given of the writer's experiments in soil sterilization for the control of various diseases of flowering bulbs, e.g., *Sclerotium tuliparum* and 'fire' (*Botrytis parasitica*) of tulips [*R.A.M.*, v, p. 33], and black rot of hyacinths (*S. bulborum*). Excellent control was obtained by one to two hours' sterilization at temperatures up to 100° C. The average increase of yield in Darwin tulips (Bartigon variety) grown in treated soil was 201·8 per cent. for 1 or $1\frac{1}{2}$ hours and 208·9 per cent. for 2 hours. The cost of the treatment [details of which are given] is estimated at Fl. 2·50 to 3·5 [approximately 4*s.* 2*d.* to 5*s.* 10*d.*] per R.R. [100 sq. m.].

Goodwin (W.) & Salmon (E. S.). **Notes on two fungicides: sulphur and Bordeaux mixture.**—*Journ. Min. Agric.*, xxxiv, 6, pp. 517–528, 1927.

The results of a series of experiments conducted for the purpose of finding the best, easiest, and cheapest way of rendering sulphur wettable and thus suitable for the preparation of combined fungicidal and insecticidal washes, showed that of all the substances tested, namely, soft soap at various dilutions, alcohol with and without oleic acid, oleic acid alone, casein in various forms, and glue, a 1 per cent. solution of soft soap in ordinary tap water was the most satisfactory. The best results were obtained with fine dusting sulphur, about 90 per cent. of which passed a 200-mesh sieve, but the best commercial brands of sublimed or ground sulphur also proved satisfactory. Calcium caseinate was more

efficient in keeping the sulphur in suspension, but as it is more troublesome in mixing, it is not recommended. Nicotine added at the rate of 6 oz. per 100 gal. to the sulphur wetted by one of the above preparations, gave no indications of any change, and therefore the use of nicotine with wetted sulphur can be recommended for trial. Details are also given of experiments made in 1926 in an unheated greenhouse to test the fungicidal value of a thick suspension of sulphur, previously treated with oleic acid, in a 1 per cent. solution of soft soap. Hop plants heavily infected with powdery mildew (*Sphaerotheca humuli*) were sprayed with the mixture in a very fine mist, and the next day all or most of the conidiophores and spores of the fungus were found to have been killed, while applications of dry sulphur proved to have a much slower and less complete action. Finally, comparative tests of sublimed sulphur and finely ground sulphur showed that both preparations possess the same fungicidal power in the case of *S. humuli*.

In the second part of this paper a brief description is given of preliminary experiments made in 1926, in which it was shown that Bordeaux mixtures prepared with commercial hydrate of lime, which, it is stated, can now be obtained in a high degree of purity, were as efficient in the control of apple scab (*Venturia inaequalis*) on the leaves of apple trees (Newton Wonder and Allington Pippin) as the mixtures prepared with quicklime, and did not cause any scorching injury to the foliage [see also *R.A.M.*, vii, p. 106].

GWYNNE-VAUGHAN (HELEN C. I.) & BARNES (B.). **The structure and development of the fungi.**—xvi + 384 pp., 1 pl., 285 figs., Cambridge University Press, 1927.

This text-book, addressed to the student rather than the investigator, gives a clear and concise outline of the structure, development, and other points of interest in the various groups of fungi. In an introductory section the physiology of fungi and other general matters are discussed. The Phycomycetes are described in some detail and occupy 83 pages, the Ascomycetes 119 pages, and the Basidiomycetes (including the smuts and rusts) 73 pages, while the Fungi Imperfecti are dismissed in two pages. The information brought together is up-to-date and is presented in an attractive form, well illustrated, and with copious literature references. A valuable section on mycological technique forms a special feature of the work, which is provided with a bibliography of 29 pages and an adequate index.

KNAPP (W. H. C.). **Bestrijding van plantenziekten. Zijn jaarlijksche taxaties van de schade wenschelijk?** [Control of plant diseases. Are annual estimates of the damage desirable?] —*Tijdschr. over Plantenziekten*, xxxiii, 9, pp. 283–291, 1927.

Of recent years the number of insect pests and fungous diseases has increased in Holland, probably owing to the practice of intensive cultivation over large areas. In this paper the writer considers the advantages and drawbacks of a system of annual estimates, on the lines of the American Plant Disease Survey, of the damage caused by insects and fungi. A rough calculation sets

the total loss from plant diseases in Holland during 1923 at 30,000,000 gulden [approximately £2,500,000]. The importance of obtaining accurate information as to the incidence of these diseases is therefore indisputable, but the problem of securing the necessary data presents great difficulties which would seem to outweigh any possible advantages. Among the principal drawbacks may be mentioned the heavy expenses incidental to the scheme and the inadvisability, from the standpoint of the export trade, of publishing statistics relating to plant diseases. It should also be remembered that in a small country like Holland fairly accurate estimates can be made without the need for any special system.

APPEL (O.). **Die Züchtung krankheitswiderstandsfähiger Sorten.** [The breeding of disease-resistant varieties.]—*Illus. Landw. Zeit.*, xlvii, 36, pp. 464–466, 4 figs., 1927.

In this paper, read at the fifth International Congress of Genetics (held in Berlin from 11th to 17th September, 1927), developments in the work of breeding for immunity from plant diseases in Germany and elsewhere are described. The examples cited include the production of potato varieties immune from wart disease [*Synchytrium endobioticum*], with special reference to Spieckermann's method of testing [*R.A.M.*, iii, p. 600], and resistant to blight (*Phytophthora infestans*) [ibid., vii, p. 112]; of wheat resistant to rust [*Puccinia* spp.]; and of vines immune from *Peronospora* [*Plasmopara viticola*] and *Oidium* [*Uncinula necator*]. In conclusion, the necessity of extending the work of selection to fruit and vegetables is briefly indicated.

SCHAFFNIT (E.). **Der gegenwärtige Stand der Forschung über Viruskrankheiten.** [The present status of research on virus diseases.]—*Beitr. zur Pflanzenzucht*, 9, pp. 25–41, 1927.

This is a general discussion on the present status of the investigations concerning the etiology of the virus diseases of plants. The scope of the term 'virus' is defined as including disorders due (*a*) to living organisms, (*b*) to enzymatic metabolic disturbances, and (*c*) to toxins produced by, and increasing in, the plant cells. Notes are given on the symptoms, effects, and mode of transmission of some important virus diseases of economic plants [all of which have been previously described in this *Review* from various sources].

PRAUSNITZ (C.). **Experimental researches on the nature of the bacteriophage.**—*The Lancet*, ccxiii, 5428, pp. 535–538, 1927.

After discussing the theories of various investigators on the nature of the bacteriophage [*R.A.M.*, vi, p. 679] the writer describes his own experiments in the elucidation of this problem.

The size of the phage corpuscles was estimated, by means of de Haën's membrane filters of graded permeability, at 20 $\mu\mu$, or close to the dimensions of collargol. There is reason to believe that the ultra-microscopic viruses are considerably larger than the phage corpuscles, probably between 100 and 200 $\mu\mu$, and the question arises whether particles measuring only 20 $\mu\mu$ can possibly be endowed with life. This question cannot be answered as yet by a demonstration of metabolism and proliferation—two of the chief

manifestations of life—since neither can, so far, be proved to exist in the bacteriophage. Tests were therefore conducted to ascertain whether the bacteriophage possesses two other important characteristics of living organisms, namely, random variability, incorrectly known as mutation, and variability in a definite direction, or adaptability.

It was shown by these experiments [details of which are given] that different subfiltrates from an agar plate culture with bacteriophagal clear areas, although apparently derived from one original phage strain, show marked variations in their behaviour towards anti-bacteriophage serum and disinfectants. It was further shown that, by repeated passages, the phage can be accustomed to withstand the action of certain concentrations of corrosive sublimate which completely destroyed the original strain. Similar results were obtained with specially procured ultra-pure substrains, which developed an increasing degree of resistance to chloramine with repeated passage.

This demonstration of random variability and adaptation or modification in the bacteriophage is thought to furnish conclusive evidence that it is a living entity.

Bronfenbrenner (J.) & Muckenfuss (R.). **On the filtrability of bacteria.**—*Proc. Soc. Exper. Biol. & Med.*, xxiv, 4, pp. 371–372, 1927.

On the basis of three years' studies the authors state that the growth sometimes obtained in the filtrate from bacterial cultures, which has been interpreted as indicating a filterable stage in the life-cycle of the bacteria, is the result of accidents or defective technique. The passage of organisms through bacterial filters is probably attributable to the coating of the surface with the colloids of the culture medium and the distribution of the charge on its particles.

Mottier (D. M.). **On the occurrence of an endophytic fungus in the prothallia of Osmunda claytoniana L.**—*Proc. Indiana Acad. Sci.*, xxxvi (1926), pp. 229–230, 1927.

According to Campbell (*Amer. Nat.*, lxii, p. 154, 1908) endophytic fungi occur in the following ferns with green prothallia: *Marattia douglasii*, *Kaulfussia aesculifolia*, *Angiopteris evecta*, *Gleichenia* spp., and *Osmunda cinnamomea*. As a result of the author's brief histological study of the continuation shoots of 3½-year-old prothallia, *O. claytoniana* can now be added to this list. The fungus appears to occupy circumscribed areas either midway between the lower and upper surfaces of the prothallium or nearer the former. The structure and appearance of the endophyte closely agree with that of the organism found in *O. cinnamomea*. It consists of rather large, tubular, branched, and multinucleate hyphae passing from cell to cell, apparently through the pits in the walls. No conidia were detected in the preparations.

The plastids in the cells containing the fungus were densely granular and stained uniformly; they were devoid of starch inclusions and contrasted noticeably in this respect with those of the non-infected cells. The invaded cells were poor in cytoplasm and

in some cases the nuclei were amoeboid in form and appeared abnormal in structure. Admission was probably gained through the rhizoids.

Magrou (J.). **La symbiose.** [Symbiosis.]—*Rev. Scient.*, lxv, 11, pp. 325–334, 9 figs., 1927.

This is a compilation of the principal investigations on symbiosis, with special reference to the work of Noël Bernard on the mycorrhiza of orchids and to various cases of association between insects and fungi.

Davison (F. R.) & Willaman (J. J.). **Biochemistry of plant diseases. IX. Pectic enzymes.**—*Bot. Gaz.*, lxxiii, 4, pp. 329–361, 5 graphs, 1927.

Three separate enzymes, provisionally termed protopectinase (pectosinase), pectase, and pectinase, are generally recognized as acting upon the pectic substances of plants. In the investigations here described protopectinase was prepared from *Rhizopus tritici* [*R.A.M.*, ii, p. 565] and *Bacillus carotovorus*, pectase from the mycelium of *Sclerotinia cinerea* [ibid., v, p. 248], and pectinase from the mycelia of *R. tritici*, *S. cinerea*, and *Botrytis cinerea*. The above-mentioned view as to the distinctive character of these enzymes was supported by the following facts. All three enzymes were not found in the same plant material; they are inactivated at different temperatures (protopectinase at 48° C., pectase at 68° to 70°, and pectinase at 60°), and also differ in their optimum hydrogen-ion concentration (protopectinase P_H 5, pectase above 7, and pectinase 3 to 6); they are almost completely separable by alcoholic precipitation; protopectinase is appreciably adsorbed by filter paper while the others are not; pectase probably hydrolyses ester linkages and pectinase glucosidic ether.

Link (G. K. K.) & Hull (Kathleen L.). **Smoothness and roughness and spontaneous agglutination of Bacterium citri, Bact. medicaginis var. phaseolicola, Bact. phaseoli sojense, and Bact. tumefaciens.**—*Bot. Gaz.*, lxxiii, 4, pp. 412–419, 3 figs., 1927.

The phenomenon of roughness and smoothness of colony form is reported for *Bacterium* [*Pseudomonas*] *citri*, *Bact. medicaginis* var. *phaseolicola* no. 23, *Bact. phaseoli sojense*, and *Bact. tumefaciens* [*R.A.M.*, vi, pp. 650, 651]. These organisms, especially the last-named, appear to be in a state of instability as regards the characters under discussion. Roughness in colony form in *Bact. tumefaciens* seems to be directly correlated with ready spontaneous agglutination in distilled water, and in 0·85 per cent. NaCl solution, while smoothness is apparently correlated with less agglutinability. Mixed cultures can be separated roughly by means of this differential agglutination. It is uncertain whether the phenomena of colony form and agglutination are both qualitative and quantitative or only quantitative.

Dvorak (Mayme). **The effect of mosaic on the globulin of Potato.**—*Journ. Infect. Dis.*, xli, 3, pp. 215–221, 2 graphs, 1927.

In order to demonstrate the effect of disease on the globulins of

a host, the writer made precipitin tests of the globulins from healthy and mosaic Triumph potato plants [cf. *R.A.M.*, vi, p. 357]. By means of a special technique [which is fully described], the cell sap, cytoplasm, an extract of immature tuber tissue, and a 3 per cent. sodium chloride solution extract from healthy and diseased plants were compared. These extracts yielded globulins which were highly specific when used as antigens in injection experiments on rabbits. In all cross-titrations, with only two exceptions, the homologous antigens gave the highest titre, the heterologous the lowest, and the homologous group antigens an intermediate titre.

It was further shown that the tuber, cell sap, and cytoplasm antigens of both the mosaic and healthy plants gave the highest precipitin titre against their homologous antisera. The results of titrating homologous cell sap and cytoplasm globulins against the antisera of the same indicate that the specific factor is common to both these fractions. The comparative averages of the group studies show that the homologous fraction is the most specific, since it produces the highest precipitin average, those of the homologous group less so, and those of the heterologous group least.

The conclusion derived from these data is that mosaic disease affects the globulin fractions of the cell sap and cytoplasm of the plant in such a way as to modify their precipitability by specific antisera.

KOLTERMANN [ALWIN]. **Die Keimung der Kartoffelknolle und ihre Beeinflussung durch Krankheiten. (Autoreferat.)** [The germination of the Potato tuber and its response to the influence of diseases. (Author's abstract.)]—*Pflanzenbau*, iv, 6, pp. 93–95, 1927.

This is a summary by the author of a paper which has already been noticed from another source [*R.A.M.*, vi, p. 745].

HIGGINS (B. B.). **Bed rot of Sweet Potatoes.**—*Georgia Agric. Exper. Stat. Circ.* 80, pp. 219–221, 1 fig., 1927.

Throughout the upper Coastal Plain district of Georgia, the principal area in which sweet potato plants are grown, a rot of bedded sweet potatoes, due to *Sclerotium rolfsii*, causes serious losses, especially during seasons of high temperatures in April and May [*R.A.M.*, v, p. 148]. In severe cases every plant is killed over large areas of the bed, while in others the roots of the young plants are badly decayed and the stems show lesions immediately below soil-level. Such plants may survive the attacks of the fungus, but they are rejected for inter-State consignments. The lesions caused by *S. rolfsii* are liable to confusion with those of black rot (*Ceratostomella fimbriata*), from which they may be distinguished, however, by their paler brown colour.

The results of a single experiment indicate that sweet potato plants with partially decayed root systems may be set in the field without any risk of further development of infection. However, the heavy losses from decay in the beds necessitate the application of preventive measures. The results of five years' tests [which are briefly described] indicate that good control may be obtained by the application of ordinary hydrated lime at the rate of 6 to 8 tons per

acre, the former quantity sufficing for light sandy soils and the latter being used on clay or loam.

Mineral fertilizers should be used in preference to cotton seed meal or other organic substances.

PARK (M.). **Mycological notes (7): Oidium disease of Hevea.**—*Trop. Agriculturist*, lxix, 3, pp. 147–150, 1 pl., 1927.

First reported in Ceylon in 1925, *Oidium* [*heveae*] has recently become more serious on *Hevea* rubber, especially at mid-country elevations. Describing the symptoms of the disease [*R.A.M.*, v, p. 629], the author distinguishes between 'primary attack' on immature leaves, with consequent defoliation, most prominent immediately after wintering, and 'secondary attack' on mature leaves, which has not yet been observed to cause defoliation and is uncommon in Ceylon.

The fact that the fungus was found on fully developed leaves during the south-west monsoon in June and July is against the Java view that the dry weather is necessary for an attack.

Under local conditions, indirect control by improving the vigour of the trees through cultivation and the application about wintering time of rapidly acting nitrogenous manures is indicated; to control secondary attacks, spraying with Bordeaux mixture as the leaves are reaching maturity is advised.

SCHWEIZER (J.). **Rhizoctonia op Hevea brasiliensis.** [*Rhizoctonia* on *Hevea brasiliensis.*]—*Arch. voor Rubbercult. Nederl.-Indië*, xi, 9, pp. 420–431, 6 pl., 3 figs., 1927. [English summary.]

The branches of young rubber (*Hevea brasiliensis*) trees in two mixed coffee and rubber plantations in the Besoeki districts of Java were found to be dying back. The trees were much too densely planted, the rubber being unduly overshadowed by the coffee. On adjacent estates where the coffee trees had been removed the rubber was healthy.

The tips of the branches were covered for a distance of about 25 cm. with very slender hyphae, sometimes extending to the petioles, and growing more or less parallel to the axis of the branch or leaf. The older hyphae (a few centimetres behind the zone of growth) formed a distinct network with nodular swellings, the whole aspect being reminiscent of a spider's web covered with hoar-frost. In places, e. g., on the petioles and at the juncture of stem and branches, the mycelium formed a profuse white mat, and even hung from the branches. A few leaves showed large grey patches originating at the base or apex. The grey coating, consisting of closely interwoven hyphae with portions of the epidermis adhering, was readily detachable, in contrast to the tenacity of the young, silky mycelium. The greater part of the underlying tissue was healthy and dark green in colour, only the centres of the areas (where the infection probably originated) being dark brown and decayed, with the consistency of paper. The diseased part of the leaf was separated from the healthy zone by a transitional area of small discoloured lesions or stripes, showing the spreading tendency of the infection.

Healthy branches and leaves brought into contact with diseased

material developed the typical symptoms of infection. The infected leaves and petioles dropped much more readily than healthy ones. The pathogenicity of the fungus was more marked on young than on old leaves.

A microscopic examination of the fungus revealed the typical hyphae, anastomoses, pseudoconidial chains, and pseudosclerotia of a *Rhizoctonia*. The hyphae were shown to penetrate the stomata of the leaves, reaching the outer wall of the mesophyll cells but seldom invading these. The infected cells and the outer layer of the leaf are killed, probably by the diffusion of toxic substances. In affected branches the epidermis and cortex are almost free from hyphae, while the vessels of the wood are full of them.

A comparison between the rubber *Rhizoctonia* and *R.* [*Corticium*] *solani* from *Vigna hosei* [*V. oligosperma*: *R.A.M.*, vi, p. 638] showed no morphological differences, but cross-inoculation experiments indicated that the former is probably a distinct physiological strain. *C. solani* from *V. oligosperma* makes poor growth on rubber for the first few days and quickly forms pseudosclerotia, while the rubber *Rhizoctonia* rapidly kills *V. oligosperma* without producing pseudosclerotia.

ABBOTT (E. V.). **Taxonomic studies on soil fungi.**—*Iowa State Coll. Journ. of Sci.*, i, 1, pp. 15–36, 1926.

During a study of the fungous flora of eleven soil plots under a definite system of cropping and fertilization at the Iowa Agricultural Experiment Station, 44 species belonging to 14 genera were isolated and identified, in addition to unidentified species of four other genera [*R.A.M.*, vii, p. 57]. Detailed morphological and physiological studies of a number of soil fungi are reported, including descriptions of four new species, namely, *Aspergillus minutus*, *A. humus*, *Spicaria violacea*, and *Trichoderma glaucum*. The results of these investigations confirm previous reports on the existence of a definite soil fungus flora [ibid., vi, p. 507], consisting chiefly of species of *Penicillium*, *Aspergillus*, *Trichoderma*, *Cladosporium*, *Rhizopus*, and *Mucor*, while representatives of other genera occur with varying regularity.

Among other difficulties incidental to the identification of soil fungi are the lack of authentic cultures for comparison, and of adequate cultural descriptions.

THAYSEN (A. C.) & BAKES (W. E.). **On the early stages of microbiological decay and humification of vegetable tissues.**—*Biochem. Journ.*, xxi, 4, pp. 895–900, 1927.

Continuing their previous investigations [*R.A.M.*, v, p. 556], the writers studied the early stages of humification of plant tissues (oat straw) as induced by micro-organisms, including a number of bacteria [which are enumerated], actinomycetes, and species of *Aspergillus* and *Penicillium*. It was shown that the hemicelluloses (pentosans) of the raw material are at least partly responsible for the appearance of the carbohydrate fraction of the humus.

In three samples of bituminous coal no definite proof could be obtained of the presence of a carbohydrate fraction in the regenerated humus, though the percentage of halogen in the chlorine

derivatives of these humus samples was of the order characteristic of a mixture of carbohydrate and lignin humus.

The muscular tissues adhering to a mummified human vertebra dating from B.C. 200 were found to have been converted into a humus with the properties of a typical carbohydrate humus.

SALMON (E. S.) & WARE (W. M.). **The downy mildew of the Hop.**—*Dept. of Econ. Mycol., South-Eastern Agric. Coll. Wye*, 28 pp., 4 pl., 2 figs., 1927.

In this paper the authors discuss downy mildew of hops (*Pseudoperonospora humuli*) [*R.A.M.*, vii, pp. 116, 117] under the following aspects: (*a*) life-history of the fungus; (*b*) course of the disease in England in 1927; (*c*) resistance and susceptibility: (*d*) estimation of the losses caused in 1927; (*e*) methods of control; and (*f*) course of events on the Continent in 1927.

The following points in this account are new. In a few severe cases the mycelium of the fungus has been found in the brown and decaying 'strig' [peduncle] of affected cones. Oospores were found in profusion during 1927 in the perianth surrounding the fruit. Spraying the hops is recommended for the first time in England. Four applications of Bordeaux mixture should be given (1) when the bines are three-quarters up the strings or poles; (2) when they have reached the top; (3) just before the plants come into burr; and (4) immediately after the burr disappears.

WHITNEY (W. A.). **Phoma anethi on Dill.**—*Plant Disease Reporter*, xi, 10, p. 126, 1927.

Specimens of dill (*Anethum graveolens*) received from Iowa were found to be heavily infected by *Phoma anethi*, the only previous record of which in the United States was from Indiana in 1915, though the fungus is well known in Europe. *P. anethi* has a well defined stromatic layer not characteristic of the genus, and its actual taxonomic position must therefore remain indeterminate pending further investigations.

WOOD (E. J. F.). **Bureau of Sugar Experiment Stations. Cane pests and diseases.**—*Queensland Agric. Journ.*, xxviii, 4, pp. 334–337, 1927.

The Ingham district of Queensland was found, during August, 1927, to be remarkably free from diseases of sugar-cane, a result attributed to the action of the Colonial Sugar Refining Company in securing that only disease-resistant varieties are cultivated, healthy seed being supplied where necessary [*R.A.M.*, ii, p. 581]. Leaf stripe [*Sclerospora sacchari*], mosaic, and leaf scald [*Bacterium* sp.] were present here and there, but whenever they occur the field is ploughed out after harvesting. Gumming disease [*Bact. vascularum*] was serious in the Mackenzie area a few years ago, but has now almost disappeared. The new varieties Korpi, Oramboo, and Nanemo appeared fairly resistant to gumming, though Oramboo showed symptoms of mosaic; the author recommends their trial, under supervision, for gumming and mosaic resistance, in the Bundaberg district.

In the Tully and El Arish areas, the sclerotial disease of sugar-

cane [ibid., iv, p. 705], designated by the author 'spindle top', was observed. The fungus binds the leaves together at the top of the cane, choking the spindle, which rots, giving the cane an appearance similar to that produced by top rot [ibid., v, p. 696], except that the cane does not put out side shoots, and the top is not easily pulled out. The two conditions are also distinguished by the appearance of the dead leaves; the bound leaf sheaths are pink, and the leaves usually show a reddish coloration extending about 3 in. from the heart. The disease is carried on trash and sometimes on the setts as the sclerotia of the fungus can adhere to the cane.

Reyes (G. M.). **The mosaic disease of Sugar Cane.**—*Philipp. Agric. Rev.*, xx, pp. 187–228, 5 pl., 1927.

This paper presents a compilation of the principal literature appearing from 1914 to 1927, inclusive, on mosaic disease of sugar-cane, and also contains some additional information based on the writer's personal observations and experience. In the section on losses from mosaic it is stated that actual counts on the Cebu Purple and Luzon White varieties showed 30 and 56 per cent. infection, respectively, while planting cuttings from diseased canes may lead to 100 per cent. infection. Other aspects of the disease (transmission of infection, alternate hosts, varietal susceptibility, and control) are discussed, with special reference to Philippine conditions. Many of the papers mentioned in the bibliography of 228 titles (arranged by order of date) have been noticed in this *Review*.

Cook (M. T.). **The effect of mosaic on the content of the plant cell.**—*Journ. Dept. Agric. Porto Rico*, x, 3–4, pp. 229–238, 6 pl., 1926. [Issued September, 1927.].

In continuation of his previous studies on the cytology of sugar cane mosaic [*R.A.M.*, v, p. 387], the writer made a comparative investigation of the changes undergone by the chloroplasts in mosaic-infected individuals of this crop and of tobacco.

The diseased sugar-cane leaves showed an enlargement or irregularity of the nuclei, and the chloroplasts were smaller than in healthy leaves, though they were slightly more numerous and larger in the outer than in the inner leaves, and in the old leaves were almost normal.

Examination of very young leaves of severely diseased plants showed many groups of cells with enlarged or deformed nuclei, which are apparently destined to grow into the chlorotic areas; there was no evidence that the spots increase in size except with the growth of the leaf. Groups of apparently normal cells, too minute for detection by the naked eye, can be found within groups of diseased cells of the chlorotic areas. Similarly, minute groups of abnormal cells may also be discerned in sections made from apparently healthy tissue.

No striking differences were found between the nuclei of healthy and mosaic tobacco plants, but the history of the chloroplasts is exactly the same as in the sugar-cane.

Intracellular bodies are rare in sugar-cane but quite common in

tobacco. They appear to be identical with those described by Ivanowski in his studies on tobacco mosaic (*Zeitschr. für Pflanzenkrankh.*, xiii, p. 1, 1903). The writer is inclined to regard these bodies as the result, rather than the cause, of the disease. Small, motile bodies are very abundant in the cells of diseased tobacco plants, but they occur also, in smaller numbers, in the cells of healthy individuals. Similar but less numerous bodies are found in diseased and healthy sugar-cane plants. No flagellate bodies were observed attacking the chloroplasts as described by Miss Eckerson in the case of mosaic tomatoes [ibid., vi, p. 523].

COOK (M. T.). **Photosynthesis of the Sugar Cane mosaic plant.**—*Journ. Dept. Agric. Porto Rico*, x, 3–4, pp. 239–242, 1 pl., 1926. [Issued September, 1927.]

The symptoms of mosaic and allied diseases of many plants indicate a reduced or disturbed photosynthesis, which usually results in reduced growth or death. For the past three years studies have been made on the photosynthetic activity of mosaic sugar-cane plants as compared with that of normal individuals.

The green areas of the diseased plants performed their photosynthesis in the usual manner, and showed a large amount of starch in the afternoon and very little in the morning, while the white and pale green or yellowish areas showed a small quantity of starch in the afternoon and practically none in the early morning. The starch-forming capacity of mosaic canes is thus evidently reduced in proportion to the amount of infection, whereas translocation is virtually unimpaired. This is the reverse of the process occurring in peach yellows and little peach, in which the cells of the diseased leaves are filled with starch while translocation is greatly reduced or completely inhibited [*R.A.M.*, i, p. 300].

It was further shown that old sugar-cane leaves infected by mosaic produced more starch than young ones, probably because the chloroplasts in the chlorotic areas of diseased individuals tend to increase in size and number with the age of the leaf [see preceding abstract].

VAN BREEMEN (P. J.). **Aphis maidis op Suikerriet bij Pasoeroean.** [*Aphis maidis* on Sugar-cane near Pasoeroean.]—*Arch. Suikerind. Nederl.-Indië*, III Deel, xxxv, (*Meded.* 12), pp. 557–577, 1927.

In continuation of his previous observations on the agency of *Aphis maidis* in the transmission of sugar-cane mosaic in Java [*R.A.M.*, vi, p. 379], the writer found that the insect begins to settle on the young shoots some time after the commencement of the rains. Winged females from other wild and cultivated Gramineae appear to be specially partial to young canes, every shoot of which may be occupied by colonies of *A. maidis* at the climax of the invasion. Altogether the insects were present on the canes under observation for about two months, but for a considerable part of this time the number of wingless aphids was very small. New cases of mosaic infection generally develop when the colonies of *A. maidis* are partially or entirely dispersed.

Van Breemen (P. J.). **Verdere waarnemingen omtrent het zwermen van Aphis maidis Fitch.** [Further observations in connexion with the swarming of *Aphis maidis* Fitch.]—*Arch. Suikerind. Nederl.-Indië,* III Deel, xxxv, (*Meded.* 14), pp. 583–588, 2 graphs, 1927.

Continuing his observations on the rôle of *Aphis maidis* in the transmission of sugar-cane mosaic [see preceding abstract], the writer noticed that activity among the insects begins some little time before swarming, though the critical period for infection coincides with the latter phenomenon. Under Pasoeroean conditions the removal of diseased material in the field should be effected not later than a fortnight after the commencement of the rains in order to avoid any further spread of infection by the aphids shortly before or during swarming.

Cook (M. T.). **The eye-spot disease of Sugar-Cane.**—*Journ. Dept. Agric. Porto Rico,* x, 3–4, pp. 207–227, 5 pl. (1 col.), 1 graph, 1926. [Issued September, 1927.]

Eye spot of sugar-cane (*Helminthosporium sacchari*) [*R.A.M.*, vi, p. 753] first appeared in a serious form in Porto Rico in 1922–3. The initial symptom of the disease is the development of minute reddish spots, which on susceptible varieties expand and either take the definite 'eye' form or appear as long, narrow, black streaks up to three or more inches in length. In such susceptible varieties as F.C. 306 and D. 109 the entire leaf may dry up, and in severe outbreaks three-quarters or more of the foliage may be destroyed. The different forms of the disease that were previously recognized [ibid., iv, p. 243] have since been found to be all due to the same organism.

The young leaves of growing cane are attacked while they are unrolling. The spores appear to be wind borne. They fall from the conidiophore very readily and it is difficult to find them even on fresh leaves unless these are collected early in the morning and handled carefully; they develop very freely, however, within 24 hours on leaves kept in a moist chamber. Their average dimensions were found to be 58·7 by 11·1 μ, with a mimimum of 22 by 6·6 and a maximum of 92 by 13 μ. The number of septa ranged from 3 to 11. The size of the spores seems to depend primarily on humidity, those formed under dry conditions being few and large while many small spores develop with sufficient moisture.

Inoculation experiments [the results of which are tabulated] were made by means of an atomizer or simply by pouring the spore suspension into the young tops of the cane, both in the field and greenhouse, to determine the relative susceptibility of the different cane varieties grown in Porto Rico. The Uba variety was the most resistant and the F.C. 306, followed by D. 109, the most susceptible. H. 109 is moderately susceptible, while the extensively grown B.H. 10 (12) and S.C. 12 (4) are fairly resistant, though both have given indications of liability to infection. Resistance was found to be correlated to some extent with the structure of the leaf, varieties in which the vascular bundles are closely placed being less susceptible than those with the bundles widely separated by parenchymatous tissue.

The writer has observed losses of 80 per cent. of the leaves over very large areas of D. 109 and F.C. 306. In one field of the latter variety 57 per cent. of the canes were killed, while seedlings and young ratoon canes are frequently destroyed in large numbers.

The results of preliminary studies on the effect of climatic factors on the incidence of eye spot show that low temperatures and high atmospheric humidity (especially the former) favour the development of infection. The best growth of the organism was found to occur at an average outdoor temperature of 73° to 77° F.

BOLLE (P[IERETTE] C.). **Een onderzoek naar de oorzaak van pokkahboeng en toprot.** [An investigation of the cause of 'pokkah boeng' and top rot.]—*Arch. Suikerind. Nederl.-Indië*, III Deel, xxxv, (*Meded.* 15), pp. 589–609, 1 col. pl., 2 figs., 1927. [English summary.]

The writer has made an investigation of the frequent occurrence of the condition known as 'pokkah boeng' or top rot [*R.A.M.*, vi, p. 642] in the new strains of P.O.J. sugar-cane, 2878 and 2722. This disease has been regarded in Java as a mechanical disorder due to the compression of the rapidly growing inner tissues by the outer unfurled leaves. The fact that the disease always occurs during the damp, warm weather accompanying the transition from the dry to the wet season has further strengthened this hypothesis.

In other countries, however, various organisms are believed to be responsible for similar diseases, e.g., bacteria by Fawcett and Cottrell-Dormer [ibid., ii, p. 338; v, p. 696] and a root fungus by Tryon [ibid., ii, p. 581], and observations made on the spread of the disease during 1927 strongly suggested a parasitic origin. Inoculation tests with pure cultures of a species of *Fusarium* consistently isolated from diseased material resulted in the development of chlorotic spots, on which red specks and stripes appear later, in the funnels of the young leaves. In severe cases the whole base of the leaf funnel, and even the growing point, soon show advanced putrefaction, while in milder cases only red lines are observed at the insertion on the stalk. These red lines widen out in places into elongated lenticular cavities, each subdivided by a number of transverse walls; these formations are termed 'ladders'. Sometimes these ladder-shaped lesions only occur in the superficial tissues, in which case they cause a crooked malformation of the internode. The ladder-shaped areas may give origin to a rot which kills a smaller or greater part of the stalk, or they may be restricted to the leaves; in the latter case, they appear as chlorotic spots, especially at the base of the leaf blade, often showing red specks and stripes, and also being accompanied by a curling of the margins and tips.

The pink conidial masses of a species of *Fusarium* are plainly visible on the chlorotic and red areas of the leaf, while the ladder-shaped lesions show purple hyphae apparently belonging to the same fungus [the cultural characters of which are fully described].

Complete and virulent infection appears to occur only when the parasite can reach the youngest, most rapidly growing parts of the host during damp, warm weather, and when the plants are still

fairly young. The disease is therefore likely to reach its maximum intensity only during seasons favouring the simultaneous development of all these factors.

BOOBERG (G.). **Bibitrot en abnormale spruitontwikkeling ('glagahvorming') bij 2878 POJ.** [Decay of setts and abnormal shoot development ('glagah' formation) in 2878 P.O.J.].—*Arch. Suikerind. Nederl.-Indië*, II Deel, xxxv, 31, pp. 789–791, 1927.

The writer briefly describes an abnormal condition, evidently connected with decay of the setts, which has recently been observed in Java in the extensively grown 2878 P.O.J. variety. The mother shoots of affected plants show a markedly elongated habit, somewhat reminiscent of those attacked by smut (*Ustilago sacchari*) [*U. scitaminea*]. Experiments showed that the use of these canes for planting had no adverse effect on the yield, and the condition is not regarded as in any way serious.

BOOBERG (G.). **Abnormale knopvorming en heksenbezemachtige uitgroeisels bij 2878 POJ.** [Abnormal bud formation and witches' broom-like excrescences in 2878 P.O.J.]—*Arch. Suikerind. Nederl.-Indië*, II Deel, xxxv, 35, pp. 886–889, 5 pl., 1 fig., 1927.

In addition to a malformation of the eyes [see preceding abstract], the 2878 P.O.J. variety of sugar-cane is affected in Java by a condition involving the production of numbers of adventitious buds close to the normal eyes. Associated with these buds are calluses, generally measuring 1 by 2 to 5 by 8 cm. in size and 0·5 to 1·5 cm. in thickness, and covered with small eyes (up to 100). The latter eventually develop into shoots presenting the appearance of a witches' broom. The adventitious buds were found to be capable of normal growth, and the malformation is attributed to external injury rather than to any pathological condition of the cane.

CIFERRI (R.) & GONZÁLEZ FRAGOSO (R.). **Hongos parásitos y saprofitos de la República Dominicana. (12ª Serie).** [Parasitic and saprophytic fungi of the Dominican Republic. (12th Series).]—*Bol. R. Soc. Española Hist. Nat.*, xxvii, 7, pp. 323–334, 13 figs., 1927.

The 12th series of the authors' descriptions of Dominican fungi [*R.A.M.*, vi, p. 753] includes the following records of phytopathological interest. *Nectria peristomata* was found on living and rotted leaves of *Vanilla planifolia*, in association with a fungus believed to be *Gnomoniopsis vanillae*, since a conidial stage of the genus *Colletotrichum* was also present. The conidia of *Phyllosticta cinnamomi* (Sacc.) Lind observed on the leaves of *Cinnamomum zeylanicum* measured up to 9 by 2·5 μ in diameter. This fungus was found in association with *Cytosporella cinnamomi*, *Sphaerella cinnamomicola* [loc. cit.], and *Pestalozzia funerea*. The last-named species was also found attacking the leaves of *Xanthosoma violaceum* in association with *Periconia pycnospora*, *Helminthosporium xanthosomae* n.sp. ad int., and *Cercospora xanthosomae* n.sp. ad. int. The last fungus causes dark, rounded or irregular spots

up to 1·4 mm. in diameter and frequently coalescing; the conidiophores are up to 90 by 5·5 μ in diameter and the conidia are hyaline or yellowish, tapering at one end, and 90 to 250 by 3·5 to 5 μ. *H. xanthosomae* forms black, amphigenous, rounded spots from 1 to 3 mm. in diameter; the conidiophores are filiform, hyaline, or pale yellow when young, and cylindrical, brown, sparsely septate, and from 35 to 90 μ in length when older. Young conidia are fusoid to subclaviform and 3- to 7-septate, while the older are yellowish to blackish, claviform or ovate-oblong, truncate at the base, 1- to 10-septate, and up to 185 by 24 μ in diameter.

GUYOT (A. L.). **Contribution à l'étude systématique et biologique de l'Asterocystis radicis.** [A contribution to the systematic and biological study of *Asterocystis radicis*.]—*Ann. des Epiphyties*, xiii, 2, pp. 79–93, 2 pl., 1927.

After summarizing earlier investigations upon *Asterocystis radicis* and *Olpidium brassicae*, the author states that in old cysts of *A. radicis* the central, granular, refractive globule which was held to differentiate this organism from *O. brassicae* is wanting, and that while the superficial asperities of the old cysts show the connecting line mentioned in the diagnosis, a distinct second line forms an almost perfect oval outside this, so that the resemblance to *O. brassicae* becomes marked. The two organisms cannot be differentiated cytologically, as both are binucleate.

Marchal, who investigated *A. radicis* on flax (*Bull. de l'Agric. Belge*, 1901), considered that the manner of liberation of the zoospores differentiated this organism from the genus *Olpidium*. The distinct exit-tube of the zoosporangia of *O. brassicae* was thought to be lacking in *A. radicis*, the zoospores emerging through a lateral opening near one end of the sporangium.

In the author's material from a large number of hosts, the sporangia of *A. radicis* resembled those seen on flax, except that the maximum dimensions were larger; on oats, zoosporangia much elongated in the direction of the length of the cell were seen close to others measuring a few microns in diameter. The longest observed by the author measured 126 μ. The release of the zoospores in severely affected roots of oats occurred either by their discharge into the host cell through a hole in the sporangial wall or through an exit-tube which penetrated through the cell wall. The latter process was also observed in roots of annual meadow-grass [*Poa annua*], beet, cabbage, and, occasionally, flax. From one to several tubes of discharge may develop from each sporangium, and their length may be up to 30 μ. Passage of the fungus from cell to cell probably takes place by means of these tubes, which have been observed to penetrate the dividing wall between two cells.

The fungus described by de Wildeman as *O. radicicolum* is thought to have been merely a form of *A. radicis* with multiple tubes of discharge. In view, also, of the occasionally identical appearance of the sporangia of *A. radicis* and *O. brassicae* and the identical mode of emission of the zoospores, the author considers that no purely morphological distinction between the two organisms can be relied on. Further, *O. brassicae* is found on at least as many

hosts as *A. radicis*, and was observed by Miss Bensaude at Wisconsin [*R.A.M.*, iii, p. 311] on roots of cabbage, tobacco, and tomato. Hence he is doubtful whether the two forms can be maintained as distinct species, much less genera.

The almost constant presence of *A. radicis* on plants affected with scorch or chlorosis [ibid., iv, p. 353] is not, in the author's opinion, necessarily related to such symptoms, which are much less prevalent than the organism to which they are commonly attributed. Scorch and chlorosis are physiological disorders, due mainly to excessive moisture. Vigorous, normal plants may contain *A. radicis* in their roots, while symptoms of scorch or chlorosis can be experimentally induced in the absence of the fungus.

DUFRÉNOY (J. & M. L.). **La notion d'espèce chez les Phytophthorées.** [The species concept in the Phytophthoreae.]—*Rev. Bot. Appliquée*, vii, 72, pp. 530–536; 73, pp. 593–602, 3 figs., 1927.

This is a review of the current literature on the physiology, morphology, and parasitic specialization of the genus *Phytophthora*. Many of the papers referred to have been noticed in this *Review*. The writers' conclusions as to the determination of species within this genus are based on those of Leonian [*R.A.M.*, v, p. 5].

PEYRONEL (B.). **Nuove osservazioni sulla biologia e sulla distribuzione geografica della Valdensia heterodoxa.** [New observations on the biology and geographical distribution of *Valdensia heterodoxa*.]—*Boll. R. Staz. Pat. Veg.*, N.S., vii, pp. 285–296, 8 figs., 1927.

The author states that *Valdensia heterodoxa* [*R.A.M.*, iii, p. 487] is parasitic on the green parts (leaves, stems, and green fruits) of a large number of plants belonging to 14 families, some of which have been communicated to him from Poland. On the leaves of *Prunus avium* it produces a shot-hole effect, on those of the strawberry the lesions resemble the spots caused by *Ramularia tulasnei*, and on all the hosts observed it appears to act as a true parasite.

The curious organs of propagation generally form only on dead leaves in very moist conditions. They are forcibly projected into the air by means of the radiating arms when mature, the arms being bent back by the turgidity of the folds which partially encircle them. The liberated bulbils adhere to the surface of leaves or other objects by means of their sticky central cushion, and germinate rapidly in the presence of free films of water (dew or rain). During the summer affected leaves of *Vaccinium myrtillus* were found to develop compact, black, elongated stromata, which are believed to be a hibernating form of the fungus. No true sporing form has been observed, but the fungus is thought most probably to belong to the Ascomycetes.

HOPKINS (J. C. F.). **The care of Tobacco seed beds.**—*Rhodesia Agric. Journ.*, xxiv, 7, pp. 736–739; 8, pp. 847–857; 9, pp. 931–934, 8 pl., 1927.

The most serious diseases of tobacco in Southern Rhodesia are stated to be white mould [*Erysiphe cichoracearum*], wildfire (*Bac-

terium tabacum), and angular leaf spot (*Bact. angulatum*) [*R.A.M.*, vi, p. 324]. A suspected case of Granville wilt (*Bact. solanacearum*) has been reported from Rhodesia, where the organism also occurs on potatoes. Only two cases of hollow stalk (*Bacillus carotovorus*) [ibid., vii, p. 121] have been recorded in Rhodesia, and none has come under the writer's observation. In addition to the typical damping-off caused by *Rhizoctonia* [*Corticium*] *solani* and *Pythium de Baryanum*, other forms of this disease have been observed in association with *Fusarium* sp. and *Macrosporium* sp., but the investigations on these organisms are still incomplete. The application of Bordeaux mixture proved beneficial in the control of damping-off. Black root rot (*Thielavia basicola*) has not yet been detected in Rhodesia.

Notes are given on a number of other diseases, together with some general directions for suitable cultivation and control measures.

Burgwitz (G. K.). Водянистая гниль плодов Томата. [Watery rot of Tomato fruits.]—*Morbi Plantarum*, Leningrad, xv, 3, pp. 105–116, 1926. [German summary. Received December, 1927.]

A detailed description is given of a watery rot of tomato fruits which did considerable damage to the crop in 1924 (particularly after the heavy floods which occurred in the autumn of that year) in the neighbourhood of Leningrad. The disease was again observed in 1925, but to a much less extent. The symptoms entirely coincided with those of a similar rot described from Virginia by Wingard [*R.A.M.*, iv, p. 195], but isolations from the diseased fruits yielded a bacterium differing in certain respects from *Bacillus aroideae*, to which the American disease was attributed. This organism, the pathogenicity of which to unripe tomatoes was proved by artificial inoculations, is a motile, aerobic, Gram-negative, non-sporing rod, 1·5 to 2·25 by 0·75 μ in diameter, with rounded ends and peritrichiate flagella, and forming characteristic yellow colonies on beerwort agar. A description is also given of its cultural characters on various other media. The bacterium, which has not yet been named, is very resistant to desiccation and to the action of direct sunlight. Tested on different vegetables, it produced a soft, watery rot of cucumbers.

Gardner (M. W.), Kendrick (J. B.), & Cochran (L. C.). **Dusting tests for the control of Tomato diseases, 1926.**—*Trans. Indiana Hort. Soc., 1926*, pp. 75–83, 2 graphs, 1927.

An account is given of a series of experiments carried out at Paoli and Greenfield, Indiana, in 1926, to determine the efficacy of two sulphur dusts (kolodust and supersulfodust) and two copper-lime dusts (containing 20 and 25 per cent. dehydrated copper sulphate, respectively) in the control of leaf spot and early blight of tomatoes (*Septoria lycopersici* and *Alternaria solani*). Extreme malformation of the young growing leaves and the cessation of apical growth followed the first applications of the dusts, but these defects were remedied by adjusting the discharge pipe of the knapsack duster used so that the cloud of dust was directed upwards

instead of horizontally. Early blight was controlled to some extent by the application of 25 per cent. copper-lime, which also increased the yields by three to four tons per acre. The cost of this treatment is estimated at about $1.50 per acre for each application, or $9 with 6 applications, for the labour alone, while the materials used cost $40.32, which is considered somewhat too high for profit. The sulphur dusts were less effective.

NECHLEBA (A.). **Notizen über das Vorkommen einiger forstlich bemerkenswerter pathogener Pilze in Böhmen.** [Notes on the occurrence in Bohemia of some silviculturally remarkable pathogenic fungi.]—*Zeitschr. für Pflanzenkrankh. und Pflanzenschutz*, xxxvii, 9–10, pp. 267–270, 1927.

A fungus believed to have been *Polyporus* [*Polystictus*] *versicolor* was reported on the stump of a broken cherry branch, but the report was not verified and the fungus may possibly have been confused with *Polyporus* [*Polystictus*] *zonatus*.

The typical conidiophores and conidia of *Trametes radiciperda* [*Fomes annosus*] were found in the hollow of a thick branch of a fifty-year-old oak tree blown down in a gale. The author believes that this stage is only formed in the dark.

Serious damage was caused to pine trees in 1925 and 1926 by *Cenangium abietis* [*R.A.M.*, vi, p. 706], which is stated to be greatly on the increase in Czecho-Slovakia. It is frequently associated with the causal organism of leaf fall [*Lophodermium pinastri*: ibid., vi, p. 705] and confusion between the two fungi is very liable to occur. Good results in the control of leaf fall have been obtained in one district by the application of wood ash to the soil in the autumn and spring.

In 1925 the fruit bodies of *Agaricus melleus* [*Armillaria mellea*] were observed in profusion on the logs of fir trees destroyed by the nun moth [*Liparis monacha*] in 1921 and 1922. The writer has noticed that damp, warm weather favours the saprophytic existence of *A. mellea*, which in dry seasons inclines to a parasitic mode of life.

NESSEL (H.). **Einiges über Baumschmarotzer. Der Schwefel-Porling oder Löcherpilz.** [Notes on tree parasites. The sulphur Polypore or pore fungus.]—*Gartenflora*, lxxvi, 10, pp. 393–395, 3 figs., 1927.

A brief, popular description is given of *Polyporus sulphureus*, which frequently attacks the wood of oak, walnut, beech, willow, acacia, plum, cherry, and pear trees, and is occasionally found on conifers, causing a reddish-brown discoloration and a dry, pulverulent decay. Affected trees become hollow and die in a few years.

Notes are also given on *P.* [*Fomes*] *fomentarius*, occurring on old beeches and birches; *P. frondosus*, which is occasionally found at the base of old oaks; the rare *P. umbellatus*, also on the base of old oaks or on the ground; and several other tree parasites of lesser interest.

RAYMOND (J.). **Le 'blanc' du Chêne.** [Oak mildew.]—*Ann. des Epiphyties*, xiii, 2, pp. 94–129, 25 figs., 1927.

In the present article the author summarizes the available information concerning oak mildew (*Microsphaera quercina*), describes the morphological and biological characters of the fungus, and discusses its systematic position. Attempts to grow the fungus on a great number of media were unsuccessful. Notes are given on the control of the disease by improved silvicultural methods and the selection of resistant varieties, while the direct measures recommended include the application to affected trees of sulphur or permanganate of potash.

A bibliography of 43 titles is appended.

DEMORLAINE (J.). **Le dépérissement du Chêne dans nos forêts françaises.** [The dying-off of Oak in our French forests.]—*La Vie Agric. et Rurale*, xxxi, 36, pp. 145–146, 1 fig., 1927.

Referring to the observations of Yossifovitch on the dying-out of oaks in Jugo-Slavia [*R.A.M.*, vii, p. 126] the writer recapitulates his own views as to the causes of the same phenomenon in France [ibid., vi, p. 452], viz., repeated attacks of *Oidium* [*Microsphaera quercina*], frequent spring frosts, caterpillar invasion, and planting with pure oak (*Quercus pedunculata*). In conclusion some silvicultural recommendations by Prof. Hüffel (Le problème forestier, 1926. Presses Univ. de France, 49, Boul. Saint-Michel, Paris V^{e}) are cited.

GEORGEVITCH (P.). **Ceratostomella quercus n. sp. Ein Parasit der Slawonischen Eichen.** [*Ceratostomella quercus* n. sp. A parasite of Slavonic Oaks.]—*Biologia Generalis*, iii, 3, pp. 245–252, 1 pl., 1927.

In this amplified description of *Ceratostomella quercus* [named in the author's previous paper *C. querci*: *R.A.M.*, vi, p. 198], it is stated that the fungus is responsible for the death of a considerable number of branches in the crowns of affected oaks. This effect is produced by the partial or total obstruction of the lumina of the vessels by the spores, mycelium, *Graphium* heads, and perithecia of the fungus, which impede the normal course of transpiration. *C. quercus*, however, is regarded as a less important factor than *Armillaria mellea* in the causation of the dying-off of oak trees in Jugo-Slavia [ibid., vii, p. 126].

FOËX (E.). **Les maladies du Châtaignier.** [Diseases of Chestnut.]—35 pp., 5 figs., Orleans, Imprimerie du Loiret, 1926. [Received December, 1927.]

In this report, read to the first National Chestnut Congress, a popular account is given of the diseases of the European chestnut (*Castanea vesca*) and of the methods for their control. The diseases referred to are those caused by *Septoria castanicola*; *Polyporus sulphureus*; *Melanconis modonia*, the conidial stage of which is *Coryneum modonium*; the 'javart' disease due to *Diplodina castaneae*, which Ducomet has identified with *Cytodiplospora castaneae* Oudemans; the ink disease (*Blepharospora* [*Phytophthora*] *cam-*

bivora), which is far the most serious of those found in France; and the American chestnut blight caused by *Endothia parasitica*.

The injury caused by *C. castaneae* varies with the locality; the trees in some areas may be killed within a year, in other districts the shoots may continue to grow in spite of the formation of local cankers, or the disease may confine itself to killing the lateral branches or extremities, sometimes first attacking the petiole. *M. modonia* has recently become more prevalent in France, where the damage caused by it is by no means negligible. Apparently, it attacks trees which have become physiologically weakened or are otherwise predisposed to infection. The identification of *M. modonia* is difficult owing to the pleomorphism of the fungus.

A valuable biblography of 133 titles is appended.

NESTERTSHUK (G. I.). Растительные паразиты Сосновых культур Осиновороющинской дачи Парголовского учебно-оп. Лесничества Ленингр. Лесн. Й-та. [Parasitic plants in Pine plantations of the Ossinovoroshtshinskaya Datcha in the Pargolovo Instructional and Experimental Forestry Circuit of the Leningrad Institute of Forestry.]—*Morbi Plantarum*, Leningrad, xv, 1, pp. 27–41, 1926. [Received December, 1927.]

An investigation carried out by the author in 1925 showed that during 1923 and 1924 young plantations of pines [species not indicated] suffered considerably in their growth, both in height and in diameter, in some parts of the Ossinovoroshtshinskaya Datcha [estate] of the Pargolovo Forestry Circuit (not far from Leningrad), although the soil and weather conditions during both years had been entirely favourable to the trees, and although the roots of the latter were found to be remarkably healthy. The damage found its expression in a great reduction in the length of the new shoots (in 1924 from 42 cm. in healthy to 14·5 cm. in diseased trees), in the width of the annual rings, and in the length of the needles (in 1923 from 4·5 cm. to 3 cm.), while the total height of the diseased trees in 1925 averaged 2·1 m. as against 4·6 m. for the healthy individuals. The author considers that the injury is mainly attributable to the following fungi: *Peridermium pini* f. *foliicola*, the aecidial stage of which, under local conditions, develops on the needles of the young pines in May and June, and the secondary hosts of which, particularly species of *Sonchus*, *Tussilago*, *Melampyrum*, *Euphrasia*, *Rhinanthus*, and *Campanula*, are widely represented in the woods; *Hypodermella sulcigena* [*R.A.M.*, v, p. 264]; *Phacidium infestans* [loc. cit.]; and *Lophodermium pinastri* [ibid., vi, p. 705]. In most cases all four parasites occurred together in the affected areas, frequently in association with each other, so that it was not possible to ascertain which of them is the most dangerous to the plantation

COLLEY (R. H.) & TAYLOR (MINNIE W.). **Peridermium kurilense Diet. on Pinus pumila Pall., and Peridermium indicum n. sp. on Pinus excelsa Wall.**—*Journ. Agric. Res.*, xxxiv, 4, pp. 328–330, 1 fig., 1927.

The authors have examined specimens and give the description of *Peridermium kurilense* and *P. indicum* n.sp. (thus renamed because

P. complanatum, with which it had been identified at Pusa, should be restricted to the form on the needles of *Pinus longifolia*), which occur, respectively, on the stems of *Pinus pumila* in the Kurile Island, Japan, and of *P. excelsa* at Kulu, N.W. Himalaya. These two fungi, with *Peridermium strobi* (*Cronartium ribicola*), appear to be the only three species of the genus which attack the stems of five-needled or white pines. It is pointed out that either or both of these two species might become serious parasites if introduced into North America. It is also stated that the similarity noted by Dietel between *P. kurilense* and the aecidial stage of *Cronartium ribicola* is also to be observed between *P. indicum* and the latter. The aecidiospores of the two Asiatic species are very similar, and although their dimensions are well outside the range of *C. ribicola*, they might be confused with *C. occidentale*. The four species can, however, be easily distinguished by the characters of their peridial cells.

The fireblight regulations and Hawthorn.—*New Zealand Journ. of Agric.*, xxxv, 3, p. 191, 1927.

Regulations for the control of fireblight [*Bacillus amylovorus*: *R.A.M.*, ii, p. 273] on apples and pears in New Zealand, gazetted 19th May, 1927, provide that, should the spread of the disease endanger any officially declared fruit growing area [ibid., ii, p. 144], all hawthorn [*Crataegus*] growing within that area, or any specified part of it, must be cut back to prevent flowering; in specified areas where the disease actually appears, all hawthorn must be destroyed.

New Zealand: Fungicides and Insecticides Act, 1927.—No. 17. 4 pp., 1927.

By this Act, dated 21st October, 1927, and operative as from 1st April, 1928, provision is made for controlling the manufacture and sale of fungicides, insecticides, and weed-killers in New Zealand.

Analysts and inspectors are to be appointed, and the method of securing samples for analysis is described. It becomes an offence, punishable by a fine of fifty pounds, to sell any fungicide, insecticide, or weed-killer not conforming to a prescribed standard, or which bears any misleading statement as to its composition, purity, strength, or efficacy. The Governor-General may make regulations by Order in Council, (*a*) prescribing the standard of strength, quality, or quantity of any fungicide or insecticide, or of any ingredient; (*b*) prohibiting the use of any substance, or of more than a specified proportion of any substance, in any preparation; (*c*) providing for the registration of vendors; and (*d*) generally for carrying out the provisions of the Act.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

APPLIED MYCOLOGY

Vol. VII APRIL 1928

Dorogin (G. N.). Заметка о **Cytosporina septospora.** [A note on *Cytosporina septospora.*]—*Morbi Plantarum*, Leningrad, xv, 1, pp. 48–50, 1 fig., 1926. [Received December, 1927.]

The author states that in describing in 1910 and 1912 (*Bull. Soc. Mycol. de France*, and *Лесной Журнал* [*Forestry Journal*], respectively) under the name *Cytosporina septospora*, a fungus found by him on the needles of *Pinus montana*, he remarked on its many points of similarity with *Brunchorstia destruens* Erikss., and that only the stromatic character of its pycnidia prevented him from so identifying it. Since then, he has had many occasions to observe the fungus on the needles of *P. montana*, *P. sylvestris*, *P. laricio*, and *P. sabiniana* from various regions of European Russia, and in one case on one-year-old shoots of *P. sylvestris*. This led him to examine more closely the history of *B. destruens*. Apparently, this fungus was first described in 1884 by Karsten as *Rhabdospora* (*Septoria*) *pinea*. Then, in 1887, Eriksson named it *B. destruens*. In 1903 v. Höhnel transferred it to the genus *Excipulina*, while in 1915 he re-established the genus *Brunchorstia* and referred it to the family Pachystromaceae, the diagnosis of which covers fairly well the morphological characters of the author's fungus [a brief description of which is given]. It is, therefore, considered that the fungus should be known as *Brunchorstia pinea* (Karst.) v. Höhn., with the following synonyms: *Rhabdospora curva* Karst., *R. pinea* Karst., *Septoria pinea* Dorog., *Excipulina pinea* v. Höhn., *Cytosporina septospora* Dorog., *Brunchorstia pini* Allesch., and *B. destruens* Erikss.

Plassmann (E.). **Untersuchungen über den Lärchenkrebs.** [Investigations on Larch canker.]—J. Neumann, Neudamm, 88 pp., 20 figs., 1927.

In this treatise, prepared during the period 1924–26 at the Botanical Institute of the Forestry College, Hann.-Münden, the writer gives a full account of the morphology, physiology, mode of infection, and taxonomy of the larch canker fungus (*Dasyscypha willkommii*) [*R.A.M.*, vii, p. 130], together with observations on various other points of interest connected with the disease caused by it. *D. willkommii* is stated never to be found fructifying on

pines, the related form on these trees being referred by the author to *D. calycina* Fr., on which parallel studies were carried out.

The author found the apothecia of *D. willkommii* throughout the year, with a period of optimum development from August to March. The formation of conidia, which always precedes apothecial development, occurs chiefly from February to June, but to some extent also at other times. The period of optimum development for apothecial formation in *D. calycina* extends from November to May, but under favourable weather conditions these organs may be produced in lesser numbers at any time. *D. calycina* forms conidia only in the late summer and autumn.

The conidia of *D. willkommii*, which are discharged in a mucilaginous mass, are thought to be incapable of causing infection at a distance from their place of origin, though they may possibly spread the disease on the same tree. In view, however, of the great difficulty of inducing germination on artificial media, it seems doubtful if the conidia are of much practical importance in the dissemination of canker. Similar considerations apply in the case of *D. calycina*.

The homothallic mycelium of *D. willkommii* developed on all the sterilized natural substrata (larch, pine, fir, oak, beech, and apple) tested, but apothecia were formed only on *Larix europaea* and *L. leptolepis*. The life-cycle of the fungus from spore to spore occupied four months. The best artificial medium for the development of the fungus was 1·5 per cent. malt agar with a hydrogen-ion concentration between P_H 5·0 and 6·0 (minimum for growth P_H 4·4). *D. willkommii* is able to grow at very low temperatures, the optimum being only 18° C. The mycelium can be induced to grow after six to eight months' desiccation, and 40 per cent. of the dried ascospores germinated at the end of seven months.

A distinction must be made between the saprophytic and parasitic life of *D. willkommii*. In the former case the fungus is found on dead branches but has no harmful effect unless the latter are still attached to the tree, in which case infection proceeds from the dead branches through the cambium, or occasionally the xylem, to the interior of the trunk. It was found impossible to infect trees though an unwounded cortex.

The results of inoculation experiments showed that wound infections are only successful when the fungus is able to develop saprophytically for a comparatively long time. This fact is of great importance from the silvicultural standpoint. Susceptibility to canker decreases with advancing age and generally ceases when the trees are between 30 and 40 years old. This is due to the increasingly vigorous formation of rough bark.

The influence of external conditions on the incidence of larch canker is discussed and their bearing on silvicultural practice explained. The development of *D. willkommii* is favoured by a high degree of atmospheric humidity, and the importance of adequate aeration is therefore obvious. Previous investigators have insisted on the need for mixed cultivation of larches and shade trees, but the author's data show that this method affords no protection against the dissemination of the ascospores, which can be carried immense distances by a current of air with a velocity of

only 1 m. per second. In pure cultivations, too, the serious risk of overshading is avoided. Where it is essential to interplant larches with other trees, the former should be planted 10 to 15 years in advance of the rest.

Little work has hitherto been done in connexion with varietal reaction to larch canker. According to Hermann (*Jahrb. d. Schles. Forstver.*, 1920) Sudetic larches are resistant. Harrer (*Dendrol. Jahrb.*, p. 203, 1925) states that the Siberian larch [*L. sibirica*] is immune. *L. leptolepis*, which has been widely cultivated in Germany for the last thirty to forty years, appears to show considerable resistance to canker.

D. calycina has been found by the writer to occur in some cases as a facultative parasite on the white pine (*Pinus strobus*), Douglas fir (*Pseudotsuga douglasii*) [*P. taxifolia*], *Thuja gigantea*, and *Chamaecyparis lawsoniana*, the two last-named being new hosts. On firs (*Abies pectinata* and *A. sibirica*) the fungus appears to occur almost exclusively (and on the other hosts it is most common) as a saprophyte.

Zach (F.). **Zur Kenntnis von Ceratostomella pini Münch.** [Contribution to the knowledge of *Ceratostomella pini* Münch.]—*Zeitschr. für Pflanzenkrankh. und Pflanzenschutz*, xxxvii, 9–10, pp. 257–260, 6 figs., 1927.

Since 1923 the author has studied the behaviour of *Ceratostomella pini* [*R.A.M.*, ii, p. 49] in pure culture, the fungus being continuously sub-cultured every two to three months during this period on sterile pine or fir wood. In all the cultures numerous conidia developed. In the initial cultures perithecia were numerous, but in course of time they almost ceased to develop and were replaced by bodies superficially resembling those of the *Graphium* stage of *C. piceae*. They consist of a short, dark stem crowned by a pale, later yellowish, drop containing conidia, which are borne on a thick column of conidiophores. The abstricted conidia average 5 to 9 μ in length by 3 to 6 μ broad and are somewhat thickened at the apex.

The *Graphium*-like bodies are actually coremia, and in their pseudoparenchymatous structure, their height (250 μ and above), and general aspect they appear to be identical with the sclerotia described by Münch in this fungus. The development of conidia on these coremia is restricted to cultures kept under very humid conditions, and does not take place in the natural habitat or in agar cultures. In such cases the terminal cells develop brown and thickened membranes, and pass into a resting stage. Flask-shaped conidia, occurring singly or in verticillate groups or tufts and measuring 8 to 12 to 4·5 μ, were regularly observed on the outer side of hyphal strands in old cultures. The distal end of the conidium was open and the internal protoplasm grew out to form a second conidium or a hypha.

Vanine (S. I.). К вопросу о влиянии синевы на пропитку древесины. [On the question of the effect of blueing on the impregnation of timber.]—*Morbi Plantarum*, Leningrad, xv, 4, pp. 187–192, 1 fig., 1926. [German summary. Received December, 1927.]

The author states that a critical statistical examination of the

results obtained by previous workers in their experiments on the effect of blueing of timber (caused by fungi belonging to the composite species *Ceratostomella pilifera*) on its impregnation, led him to consider as erroneous the generally accepted view that this discoloration negatively affects the permeability of the wood to disinfectants. He was confirmed in his opinion by the results obtained in 1925 in the neighbourhood of Leningrad, when a large number of heavily discolored pine railway sleepers were impregnated with zinc chloride, the indications being that the chemical was equally absorbed by the normal and the blued wood. He checked these results in an experiment made under laboratory conditions [some details of which are given], which showed no appreciable difference in the penetration of the solution into the normal and discoloured timber. He believes that the former, incorrect view arose from the fact that the experimenters did not use homogeneous material in their tests.

BARNETT (G. B.). **The protection of trees from wood rot. Preventive and curative measures.**—*Agric. Gaz. New South Wales*, xxxviii, 9, pp. 721–723, 4 figs., 1927.

Brief directions are given in popular terms for the treatment of decayed exposed surfaces on trees; after cutting the wood away to healthy tissue, and disinfecting the surface of the latter with mercuric cyanide followed with a coating of cold tar, the cavity should be filled with a mixture of sawdust and hot tar, the surface of the filling being given several coats of tar or a facing of cement, and left a little below the bark line, in order that the cambium layer may grow over it. The chief advantage of this filling over the common cement filling is that it bends with the tree.

RABANUS (A.). **Bemerkungen über neuzeitliche Holzimprägnierung mit wasserlöslichen Salzen.** [Observations on modern timber preservation with water-soluble salts.]—Reprinted from *Korrosion und Metallschutz*, ii, 3, 7 pp., 9 figs., 1926. [Received January, 1928.]

An account is given of the writer's laboratory experiments to ascertain the degree of toxicity of basilite [*R.A.M.*, vi, p. 707] to wood-destroying fungi. In one test blocks of pine wood treated with various preparations were placed in contact with vigorous cultures of *Polyporus sulphureus*. There was no growth of the fungus after 16 days in the flasks containing the blocks impregnated by vacuum and pressure with 1 per cent. basilite or 0·5 per cent. dinitrophenolanilin; the corresponding figures for sodium fluoride (2 per cent.), and copper sulphate and zinc chloride (8 per cent.) were seven days and one day, respectively. The corrosive action of basilite on iron was found to be slighter than that of distilled water, so that this factor can be disregarded for practical purposes. It is stated that in many mines untreated props decay in four to eight months, especially under warm and humid conditions; in one such case the material impregnated with basilite was still sound in 1925 after 11½ years. Similar data are available from other sources.

CURTIN (L. P.). **Experiments in wood preservation. II. Arsenites of copper and zinc.**—*Indus. & Engin. Chem.*, xix, 9, pp. 993–999, 9 figs., 1927.

In continuation of his previous investigations on wood preservation [*R.A.M.*, vii, p. 130], the author here gives formulae and describes methods for impregnation by a one-movement process with the following substances: zinc meta-arsenite, copper ortho-arsenite (Scheele's green), copper aceto-arsenite (Paris green), copper fluoride, and basic copper chloride. The three first-named compounds are stated to have important applications as wood preservatives.

It is shown that the meta- and ortho-arsenites of copper are soluble in acid solutions of P_H 5, i.e., in the presence of wood-rotting fungi which evolve acid of this strength.

Some toxicity tests were carried out with copper aceto-arsenite and zinc meta-arsenite in powdered form in agar-malt-syrup media. The compounds were found to possess a killing point in relation to *Fomes annosus* of 4 to 10 parts per 10,000 parts of the medium. The toxicity of these substances is several times greater than that of zinc chloride.

Boiling tests are described which show that the arsenites of zinc and copper are highly resistant to leaching out.

The results of laboratory and field experiments [details of which are given] show that the above-mentioned preparations are as toxic in practice as theoretical considerations suggest.

DAVIS (W. H.). **Notes on the Cercosporella leafspot of Chinese Cabbage in Massachusetts.**—*Phytopath.*, xvii, 9, pp. 669–670, 1 pl., 1927.

A leaf spot of Chinese cabbage [*Brassica pekinensis*] observed in Massachusetts during the autumn of 1925 and 1926, showed two distinct forms of the initial symptoms: (*a*) minute, white or dilute-brown, circular, papery lesions, definitely delimited and often crossed by dead, dark brown veinlets; (*b*) minute, yellow, circular spots which spread to an average of 8 mm. in diameter, the centres eventually also becoming white and papery and being crossed by the dark brown veinlets; these sometimes coalesced into large, dried, irregular dead areas [*R.A.M.*, vi, p. 454].

Two kinds of mycelium were found in the lesions, (*a*) with hyphae 2 to 4 μ in diameter, mostly intercellular, and (*b*) with hyphae composed of large vacuolate cells, 7 to 34 by 5 to 6 μ. The former were situated near the margin and the latter in the dead, papery part of the lesion.

Sclerotioid masses of mycelium formed under the epidermis, from which arose very short conidiophores. The latter were unbranched, mostly in clusters but sometimes single, hyaline, and up to 13 by 3 μ. Conidia sometimes also originated from hyphal strands which had penetrated the epidermis of the leaf. The conidia were hyaline, 1- to 7-, mostly 3- to 4-celled, elongate-cylindrical, seldom fusiform and constricted at the cross-walls, curved or straight, and measured 22 to 100 by 1·5 to 3·5 μ (average 56 by 2·5 μ).

The fungus has been provisionally identified as *Cercosporella albo-maculans* (E. & Ev.) Sacc., with which, from the descriptions

and such herbarium material as was available, the author considers *C. brassicae* Jaap and *Cercospora bloxami* B. & Br. to be synonymous.

ŠKORIĆ (V.). **Bacterial blight of Pea: overwintering, dissemination, and pathological histology.**—*Phytopath.*, xvii, 9, pp. 611–627, 3 pl., 8 figs., 1927.

In 1926–7 the author isolated *Pseudomonas pisi* from peas showing symptoms of bacterial blight [*R.A.M.*, v, pp. 69, 591] at University Hill Farm, Wisconsin.

When flowers and pods of pea plants were sprayed with water suspensions of the organism, stomatal infection occurred on the sepals and bracts, and the disease spread towards the peduncle and pods, killing the flowers and causing young pods to shrivel. Badly infected pods contained seed the surfaces of which showed a bacterial film and sometimes a water soaked spot near the hilum. Penetration of the bacteria into the seed occurs through the funiculus to the seed coat, but they do not appear to reach the cotyledons. In moist conditions, short cirrhi, which later formed into droplets of bacterial slime, exuded from infected plants.

Isolation experiments made from closed pods showing bacterial lesions proved that *P. pisi* overwinters as a dry film on the seed surface and in the seed-coat, where it can remain for at least ten months. Infected seed sown in pots gave rise to diseased plants only when abundantly watered, infection apparently taking place after germination commences by contamination of the surface of the seedlings, especially the outer covering of the plumule. Infection spreads to the surrounding plants from these primarily infected seedlings.

Needle prick inoculations into the stem caused wilting of the leaflets or even the whole plants. The organism may produce large cavities in the plant by breaking down the cell walls. Rupture of the vessels and entry of the organism into the vascular bundles may follow and result in wilting. Where the stipules and leaves showed large lesions at the base, the vessels of the leaves and leaf traces, and sometimes those of the stem, contained bacteria. Stomatal penetration on stems and pods was only occasionally observed; ordinarily the bacteria enter through wounds, except in the leaves and inflorescences.

P. pisi was found to be pathogenic to field and garden peas, to *Dolichos lablab*, cowpea [*Vigna sinensis*], and different species of *Lathyrus*.

The author's investigations indicate that control may be possible by seed disinfection.

RIKER (A. J.). **Une maladie bactérienne des Fèves.** [A bacterial disease of Broad Beans.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 3, pp. 199–200, 1927.

The author states that successful inoculation experiments have been conducted in England with a bacillus isolated several times from broad beans [*Vicia faba*] affected with chocolate spot disease [attributed to *Bacillus lathyri* Manns and Taub.: *R.A.M.*, iii, p. 198], and that the organism has, in accordance with the 1924

code of the Society of American Bacteriologists, been given the number 5011–32105–0202. It is killed in ten minutes at 60° C. Invasion occurs through the intercellular spaces at first, but the organism spreads for some distance through the vessels. Infection is favoured by a temperature of 20° to 30°, very high humidity, and actively growing and turgid plants.

STAPP (E.). **Die bakterielle Welkekrankheit der Bohnen.** [The bacterial wilt disease of Beans.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 9, pp. 88–90, 5 figs., 1927.

The work of Miss Hedges on bacterial wilt of beans (*Bacterium flaccumfaciens*) [*R.A.M.*, v, p. 463] in the United States is briefly summarized. Attention is further drawn to the probable occurrence of this disease in Germany, since bean seed obtained from German seed dealers was found on arrival in America to be infected by the causal organism of bacterial wilt. Either the disease has hitherto escaped notice in Germany, or it has been confused with anthracnose (*Gloeosporium*) [*Colletotrichum lindemuthianum*].

FRIEDL (G.). **Die Cercosporakrankheit der Zuckerrübe.** [The *Cercospora* disease of the Sugar Beet.]—*Nővenyvédelem*, [iii], 6, 1927. [Abs. in *Fortschr. der Landw.*, ii, 17, p. 570, 1927.]

Immense damage has been caused [in Hungary] of recent years by leaf spot of sugar beets (*Cercospora*) [*beticola*], the losses amounting in places to 50 or 60 per cent. of the crop. The best control has been obtained with Bordeaux mixture and verdola dust, which should be applied alternately before the symptoms begin to appear.

NOLLA (J. A. B.). **Onion-leaf anthracnose.**—*Journ. Dept. Agric. Porto Rico*, x, 3–4, pp. 245–256, 3 pl., 1926. [Issued September, 1927.]

A new and destructive anthracnose disease of market onions and false shallots (*Allium cepa*) was first observed in one of the eastern districts of Porto Rico in January, 1924. The red, yellow, and white varieties were found to be equally susceptible to attack and no difference in the degree of infection was observed on plants of varying ages, or on varieties from tropical and temperate zones.

Minute elliptical or oval, whitish spots (rapidly assuming a red to violet tinge on the red varieties) appear on the leaf blades, where they extend and cause a rotting of the tissues down to the bulb scales during rainy weather. The diseased tissues in all varieties become brittle when dry.

Hydrosis is the first histological symptom accompanying the penetration of the fungus. This is followed by the disorganization of the protoplasts and discoloration of the cell walls. The cells of the palisade layer collapse, the fungus penetrates both into and between the outer parenchyma cells, and eventually into the vascular bundles. In the advanced stages of the disease the tissues consist merely of a skeleton of epidermis and ruptured cell walls.

The fungus shown by controlled infection experiments to be responsible for the disease is said to be a new species of *Colletotrichum* and is named *C. chardonianum*, with a diagnosis in English. It forms applanate, ferruginous, flesh-coloured, or brown acervuli. The setae are brown, septate, acute or occasionally blunted at the tips, and measure 98 to 170 by 4·8 μ. The conidiophores are simple, cylindrical, terete, or with rounded base and pointed tip, and measure 7·9 to 79·5 by 1·7 to 3·7 μ. The oblong conidia, with one or both ends rounded, are slightly curved and measure 6 to 80 by 1·7 to 7 μ. They germinate in water at 21° C. in $3\frac{1}{2}$ to $4\frac{1}{2}$ hours, forming primary, secondary, and even tertiary appressoria as well as secondary conidia. Germination was inhibited at 18° and 33°. In synthetic culture media the best growth was made at 27°, and in the field the disease appears during seasons when the temperature ranges from 23° to 30°. The fungus grew well on carbohydrate media, especially starch, and the colour of the mycelium varied from hyaline to dark according to the medium used.

The perpetuation of the fungus is apparently secured by the hibernation of the mycelium in onion débris. Moisture is thought to play the most important part in determining the degree of severity of anthracnose, and it appears essential in the dissemination of conidia.

The results of preliminary laboratory tests indicate that good control of onion anthracnose may be effected by dusting with corona colloidal copper, kil-tone copper dust [*R.A.M.*, vi, p. 498], Banks's colloidal copper, and copper hydroxide. Kolodust and dusting sulphur were less effective.

KATTERFELD (N. O.). К биологии **Peronospora schleideni Ung.** [Contribution to the biology of *Peronospora schleideni* Ung.] —*Morbi Plantarum*, Leningrad, xv, 2, pp. 71–87, 1 fig., 1926. [German summary. Received December, 1927.]

This is a detailed account of the author's morphological and biological investigation of the onion downy mildew (*Peronospora schleideni*), which was made in 1924 and 1925 at the Chief Botanical Garden in Leningrad in view of the considerable economic importance of the disease in the vicinity of Leningrad and in various other onion-growing centres in European Russia. The experimental part of the work is stated to have been made in ignorance of Murphy's work on the same subject [*R.A.M.*, vi, p. 138]. The results of the present investigation agree with Murphy's findings in regard to the part played by the perennial mycelium of the fungus in the perpetuation of the disease, since it was found in from 42 to 45 per cent. of a large number of onions investigated, while oospores were comparatively rarely found in diseased leaves and could not be induced to germinate under any of the conditions tested. The perennial mycelium occurs in all portions of the infected bulbs, but is most constant and abundant towards their apex; this fact greatly simplified the examination of the samples, since it was established that the freedom of the apical tissues from the mycelium invariably denoted the freedom of the whole bulb from infection. The peren-

nial mycelium is easily differentiated from the summer mycelium (which begins to develop as soon as the onions are set in favourable conditions for growth) by its thicker walls, the presence of numerous large drops of oil, the shape of the hyphae and sometimes of the haustoria, a much more restricted distribution in the infected tissues since it occurs in clusters, and by the absence of any visible injury to the host. These characters indicate that the mycelium remains during the winter in a more or less dormant condition, and microscopical examinations of infected bulbs at intervals of two months failed to show any extension of the mycelium during that stage.

In infected bulbs planted in a hothouse in the spring of 1925 it was seen that the mycelium (which immediately started to develop) followed the elongation of the leaves, for the most part massing itself towards the apical portion of the latter; towards the base the mycelium was much scarcer and frequently still in a dormant or semi-dormant state, as shown by its thicker walls and the presence of oil drops. When the leaf attained its final length, most of its tissues were usually permeated with the mycelium which, under favourable conditions of moisture and temperature (about 20° R.) [25° C.], started to produce conidia within nine days from planting the bulbs. In the early stages of their growth the young leaves show no outward signs of infection; they start to die off, usually from the top downwards, only some time after the emergence of the conidiophores. If, at the time when the latter are normally formed, external conditions are unfavourable for the production of conidia, the latter subsequently fail to be produced under any circumstances.

At temperatures from 10° to 12° R. [12·5° to 15° C.] about 85 per cent. of the viable conidia germinated within $2\frac{1}{2}$ hours, and 100 per cent. in five hours. The conidium produced a germ-tube up to 1700 μ long and from 5 to 10·5 μ broad, which was observed always to penetrate into the host tissue through a stoma. In the hothouse the incubation period ranged from 10 to 15 days, and in the open from 13 to 18 days. In damp air the conidia preserved their viability for 10 days, but they were killed within two hours when exposed to sunshine in a dry atmosphere.

It was found that, under experimental conditions, the mycelium passed down from the leaves into the bulbs in 21·5 per cent. of the cases, but in nature the percentage may be as high as 45. In such cases the great majority of the adventitious bulbils on the plant were infected, but the infection was not always transmitted from the mother to the daughter bulbs when an infected onion was planted, since out of seven bulbs obtained from three diseased onions only four contained the mycelium. All the evidence collected tended to show that the disease is not transmissible by the seed.

The paper concludes with some recommendations for control, stress being laid on the necessity of testing the onions before planting and on the advisability of roguing those that develop disease symptoms in the field, as early as possible. Preliminary experiments indicated that the incidence and spread of the disease in the field are somewhat reduced by repeated applications of Bordeaux mixture.

NICOLAS (C.) & AGGÉRY (Mlle). **Sur un Heterosporium parasite de l'Oignon.** [On a *Heterosporium* parasitic on Onion.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 3, pp. 195–198, 13 figs., 1927.

In March, 1927, young onions growing near Toulouse developed a disease characterized by a withering of the tip of the leaves, the formation of dry patches scattered over the leaf surface, and a dark, olive-green down on all withered parts. Examination showed the latter to be due to a species of *Heterosporium*. The conidia were verrucose, brownish, cylindrical, one- to four-celled (usually bicellular), slightly or not at all constricted at the septa, and measured 55 to 100 (rarely 120) by 10 to 12·5 μ. They were borne in heads of one to three, on erect, simple (rarely uniseptate at the base), nodulose conidiophores, measuring 40 to 115 by 7.5 to 10 μ.

A table is given showing the characters of the species of *Heterosporium* on *Allium* and *Ornithogalum*, with none of which the above-described species agrees. It is, however, considered to be a variety of *H. allii*, and is named *H. allii* var. *cepivorum* n. var., a Latin diagnosis being given.

LEACH (J. G.). **The relation of insects and weather to the development of heart rot of Celery.**—*Phytopath.*, xvii, 9, pp. 663–667, 2 figs., 1927.

A heart rot of celery, associated with *Bacillus carotovorus* and characterized by a brown, mushy decay of the heart leaves, sometimes leading to the death of the plant, appeared near St. Paul, Minnesota, during hot, dry weather, but was arrested by rainy periods, during which the rot was confined to the outer leaves and petioles.

Many insect larvae (especially those of *Scaptomyza graminum* and *Elachiptara costata*) were found near the first spots on the heart leaves, and similar spots developed around the holes in the leaves caused by maggots hatched from eggs placed on them, control leaves on which eggs were not placed remaining healthy. Typical cultures of *B. carotovorous* were isolated from the spots thus produced.

The arrest of the heart rot often depends on the fact that the eggs are normally deposited in damp places. In dry weather they would, therefore, be deposited only on the heart leaves, while during rain the outer leaves would serve.

These insects are considered to be probably the chief agents of dissemination of heart rot, as the adult flies feed on the decaying tissues and carry viable bacteria to the healthy leaves on which they deposit their eggs.

MERCURI (S.). **Marciume radicale del Carciofo.** [Root rot of the Artichoke.]—*Boll. R. Staz. Pat. Veg.*, N.S., vii, 3, pp. 347–364, 8 figs., 1927.

Early in 1927, artichokes [*Cynara scolymus*] growing near Rome were seriously affected by a root rot due to *Rosellinia necatrix*, the symptoms of which are described. Diseased roots were covered with a white, effused mycelium, which later turned brown, the part in contact with the root eventually becoming black.

The optimum temperature for the growth of the fungus in culture was between 16° and 18° C. On various media it behaved as in nature, growing vigorously when moisture was sufficient and the temperature moderate, but contracting and forming sclerotial crusts under dry, hot conditions. Its P_H optimum was found to be approximately 6·2, but some growth occurred at 9·2 and 3·2. On acid media, the surface mycelium was a much more intense black than on alkaline, the colour intensity of the black mycelium appearing to be directly related to the hydrogen-ion concentration.

The hyphae of the white mycelium measured 2 to 5 μ in diameter, and were straight or slightly curved, while those of the dark mycelium were 3 to 9 μ, straight, almost rigid, and very thick-walled. The pear-shaped swellings of the latter were much more frequent and characteristic than those of the former.

Spores were not produced in culture, but the conidial stage was observed on an artichoke root after about 3 months in a moist chamber. Each conidiiferous branch of the coremium formed 15 to 20 hyaline, ovoid conidia, 2 to 3 μ long.

Experiments with various fungicides showed that *R. necatrix* was most susceptible in culture to sodium arsenite, germisan, and uspulun, with which field experiments are to be conducted.

SZEMBEL (S. J.). О новом нахождении **Sphaerotheca fuliginea (Schlecht.) Pall.** на Дыне. [A new record of *Sphaerotheca fuliginea* (Schlecht.) Pall. on Melon.]—*Morbi Plantarum*, Leningrad, xv, 1, pp. 51–52, 1926. [Received December, 1927.]

The author records the discovery in 1925 in the government of Astrakhan of *Sphaerotheca* [*humuli* var.] *fuliginea*, the ascigerous stage of the powdery mildew of Cucurbitaceae, on melon leaves. The perithecia were from 75 to 98 μ in diameter and the asci ovoid and 70 by 55 μ.

SALOMON (R.). **La situation viticole. Vignoble de Seine-et-Marne.** [The situation in the Vine-growing industry. The vineyards in the Seine-et-Marne.]—*Rev. de Vitic.*, lxvii, 1734, pp. 188–190, 1927.

In spite of the severe outbreak of mildew [*Plasmopara viticola*] in the northern vineyards of the department of Seine-et-Marne in 1927, the author states that the customary three applications of Bordeaux mixture, followed by three dustings with sulphur-copper sulphate dust gave complete control of the disease in his vineyards. In an experimental plot at Dammarie-les-Lys, where 55 grafted varieties were treated, no trace of brown rot [the symptoms of the disease on the fruit] could be detected. The following non-grafted vines, Baco 24–23 no. 1, Oberlin 595, and Gaillard-Girerd no. 2, received no treatment but also remained free from the disease. Of the non-grafted vines receiving one treatment with Bordeaux mixture, Bertille-Seyve nos. 453, 322; Castel nos. 2528, 4001, 8930; Gaillard-Girerd no. 194, and Hybride Fournié showed no infection

of the fruit, while Castel no. 1919, and Seibel nos. 156, 880, were the most susceptible, having from 20 to 30 per cent. fruit infection. Gaillard-Girerd no. 157, the fruit of which is generally considered immune, showed an infection of 10 per cent. of the grapes in spite of the usual treatment.

Cadoret (A.). **Les grandes pluies d'août et la bouillie bleue.** [Heavy rains in August and blue mixture.]—*Prog. Agric. et Vitic.*, lxxxviii, 36, pp. 231–232, 1927.

The heavy rainfall and high temperature experienced in Savoy during August, 1927, led to widespread attacks of vine mildew [*Plasmopara viticola*], some vineyards incurring a loss of 50 per cent. of the grapes.

In Touraine and Savoy, damage was most severe in three groups of vines: those treated with weak acid or neutral Bordeaux mixture, even though seven or eight applications had been made; those not kept blue [*R.A.M.*, vi, p. 654] up to 14th July, treatment not being continuously given to preserve the new shoots; and those treated only once or twice monthly from May to July.

In Savoy and Grésivaudan Iserois, however, all vines treated according to the author's directions [ibid., iii, p. 187] remained completely free from mildew.

Ravaz (L.). **Chronique: Le mildiou d'automne. Traitement tardif.** [Current events. Mildew in autumn. Late treatment.]—*Prog. Agric. et Vitic.*, lxxxviii, 38, pp. 276–278, 1927.

A late attack of vine mildew [*Plasmopara viticola*] is stated to have occurred in the Rhone valley after the storms which marked the beginning of August, 1927. The tips of the shoots, which were still growing and had received little or no treatment, were severely affected.

Even where Bordeaux mixture was regularly applied, vine mildew caused great loss in places as a result of the frequent rains. The strength of the mixture used was often too low (1 per cent.). After the severe attack in the Gard region in 1915, inquiry established the fact that the vines which had resisted mildew best had been sprayed very copiously with mixtures containing 3 or 4 per cent. copper sulphate. The formula recommended by Cadoret is quoted [see preceding abstract], and the use of generous quantities of the mixture urged. In upper Savoy and Switzerland about ten hectol. per hect. [nearly 90 galls. per acre] are used in each application.

Moralès (C.). **Actualités: L'esca en Espagne.** [Current events. 'Esca' disease in Spain.]—*Rev. de Vitic.*, lxvii, 1731, p. 140, 1927.

'Esca' disease (or apoplexy) of the vine [*Stereum hirsutum*: *R.A.M.*, vi, p. 711] for the first time assumed alarming proportions during 1927 in the region of La Mancha in Spain. In Socuellamos, described as one of the most important vine-growing areas in Spain, more than half the crop had already been lost by September and the situation was becoming worse. The condition followed upon the heavy rains experienced during the previous winter.

KRAMER [O.]. **Die Stielfäule der Reben und ihre Bekämpfung.** [The stalk rot of Vines and its control.]—*Der Weinbau*, p. 139, 1926. [Abs. in *Fortschr. der Landw.*, ii, 17, p. 570, 1927.]

Stalk [or grey] rot of the vine (*Botrytis cinerea*) is particularly prevalent in very wet summers when rapid drying of the wood is impeded. The latter process should be facilitated as far as possible by timely summer pruning and the regular eradication of weeds, while close planting should be avoided in new sites. Excessive applications of nitrogen render the vines more susceptible to infection. Bordeaux mixture has not been found effective in the control of grey rot, for which soft soap is stated to be the sole preparation of any value. The use of an emulsified soft soap is recommended, since most ordinary brands considerably delay maturity.

RIVES (L.). **Note sur l'anthracnose des hybrides.** [A note on anthracnose of hybrids.]—*Prog. Agric. et Vitic.*, lxxxviii, 38, pp. 282–283, 1927.

The following hybrid varieties of the vine are stated, as a result of several years' observations, to have proved highly susceptible to anthracnose [*Gloeosporium ampelophagum*] in the neighbourhood of Toulouse: Malègue 829–6, Castel 19637, Seibel 5813, 1000, and 5163, all these being attacked in spite of thorough treatment with sulphuric acid solution. Seibel 6468, 6740, 6905, and 4995 were also rather susceptible, and in some cases Couderc 7120 and 2 were moderately affected. Seibel 4986, 4762, 5213, Bertille-Seyve 893, and Couderc 3 proved more resistant than the foregoing, but were not immune. Very few spots were noticed on Seibel 5279, 5455, 5437, 5860, while even greater resistance was shown by Seibel 5409, 5450, 5487, 5575, 5912, 6092, Boco 1, and Baco 22 A. In one area, S. 5412 remained unaffected although surrounded by vines of the 829–6 variety which had been completely destroyed by anthracnose. The former variety, however, is not entirely satisfactory in other respects.

FOMIN (E. E.). К морфологии **Cercospora roesleri (Catt.) Sacc.** на Винограде (**Vitis vinifera**). [On the morphology of *Cercospora roesleri* (Catt.) Sacc. on the Vine (*Vitis vinifera*).]—*Morbi Plantarum*, Leningrad, xv, 2, pp. 100–101, 1926. [Received December, 1927.]

The author states that in examining some exsiccata of vine leaves collected in the south of Russia and labelled as bearing *Cercospora roesleri*, he found two conidiophores, of which one bore a chain of three conidia and the second had a similar chain still attached to it and a few separate conidia lying above the latter. Although the spores were somewhat smaller than indicated in the existing diagnoses of *C. roesleri*, it is considered that they belong to this species, since their colour and the morphology of the conidiophores entirely agree with the descriptions. It is also pointed out that Potebnia has already stated that in culture the fungus occasionally produces chains of several conidia. This discovery is believed to show that *C. roesleri* may occasionally, and possibly only under certain environmental conditions, produce chains of spores.

Gram (E.), Jørgensen (C. A.), & Rostrup (Sofie). **Oversigt over sygdomme hos landbrugets og havebrugets kulturplanter i 1926.** [Survey of the diseases of agricultural and horticultural cultivated plants in 1926.]—*Tidsskr. for Planteavl*, xxxiii, 5, pp. 781–841, 1927. [English summary.]

This report, prepared on similar lines to those of previous years [*R.A.M.*, vi, p. 335], contains numerous references of phytopathological interest, of which the following may be mentioned. The heavy rainfall in February and again during the greater part of the summer promoted the development of net blotch of barley (*Pleospora teres*), while wheat and other cereals were seriously damaged by foot rot, associated in part with the attacks of *Ophiobolus graminis* and *Leptosphaeria herpotrichoides* and also to a great extent with infection by *Fusarium culmorum*, *F. avenaceum*, *F. herbarum*, and *F. minimum* [*Calonectria graminicola*], of which the first-named is the most widespread and virulent. The incidence of this disease can be reduced by seed disinfection and improved cultural measures, e. g., adequate spacing and suitable crop rotation, avoiding the succession of wheat and barley or vice versa [cf. ibid., vii, p. 87].

Red clover was attacked by *Gloeosporium caulivorum* [ibid., vi, p. 99], and kidney vetches (*Anthyllis vulneraria*) by *Helminthosporium anthyllidis*.

Mosaic disease of beets was very widespread and resulted in a considerable reduction of yield (18 per cent. in one experiment to test the comparative seed production of infected and healthy plants). One case of infection by *Ascochyta betae* was reported. In an experiment with Barres beets the germination percentage of dusted seed was almost twice as high as that of the untreated lot [ibid., vi, p. 649].

The roots and shoots of carrot seed plants were attacked by *Alternaria radicina*.

Late blight of potatoes (*Phytophthora infestans*) was unusually severe in 1926, the first symptoms on early varieties being observed on 7th June in the vicinity of Copenhagen, while on late ones infection appeared at Lyngby on 28th June. Excellent control of this disease was given by one or two applications of a copper-soda spray prepared from a proprietary copper-soda powder (Pulver No. 12 from the Nordisk Droge- og Kemikalieforretning). When used as a dust, however, this preparation caused some injury to the foliage. Nosperit (50 or 100 kg. per hect.) and pota (100 kg.) dusts were effective against *P. infestans*, though not equal in this respect to Bordeaux mixture [ibid., vi, p. 747].

Wart disease of potatoes (*Synchytrium endobioticum*) occurred in two new localities in south Jutland.

Cock's-foot grass [*Dactylis glomerata*] was so severely injured in one locality by *Erwinia* [*Bacterium*] *rathayi* [ibid., vi, p. 663] that the crop had to be mown down.

Coniothecium chomatosporum [ibid., v, p. 470] produced deep fissures on apples in two localities, this being the first record of the fungus in Denmark.

Serious defoliation of red and black currants and gooseberries

was caused throughout the country by *Gloeosporium ribis* and *G. curvatum* in conjunction with *Septoria ribis*.

One case of buck-eye rot of tomatoes (*P. parasitica*) was recorded.

Mildew of hydrangeas (*Oidium hortensiae*) [ibid., vii, p. 172 and below, p. 245] reported for the first time during the year, now occurs in most nurseries, and is apparently controllable only by fumigation with sulphur.

Puccinia mirabilissima was found on *Mahonia aquifolium* in several places.

The mildews of roses (*Sphaerotheca pannosa*) and of cucumbers (*Erysiphe cichoracearum*) were controlled to some extent by cosan (1 in 1,000).

BONDARTZEFF (A. S.). Двадцатипятилетняя деятельность Отдела Фитопатологии Главного Ботанического Сада с **1901** по **1926** г. [Twenty-five years' work of the Phytopathological Section of the Chief Botanic Garden, from 1901 to 1926.]—*Morbi Plantarum*, Leningrad, xvi, 1, pp. 1–17, 2 graphs, 1927.

In this paper, written in commemoration of the twenty-fifth anniversary of the foundation of the Phytopathological Section (of which the author has been in charge since 1913) of the Chief Botanic Garden in Leningrad, a review is given of the work done and the progress achieved since its inception in 1901 under the leadership of A. A. Jaczewski. A graphic description is given of the difficulties the Section had to surmount during its existence, especially in the years of internal strife that marked the post-revolution era, when, for a time, the monetary subsidy it received from the State amounted to a couple of pounds per annum, finally reaching the sum of 1,000 roubles (about £100) in 1926. It was only thanks to the untiring energy and selfless devotion of the entire staff that the Section was able to attain its present status, that of the leading institution of this nature in Russia.

A brief outline is also given of the activities of the Section, which include the issue of the periodical journal *Morbi Plantarum*. Of the investigations carried out during the period since its foundation, special mention is made of those on hop mildew [*Sphaerotheca humuli*], cotton wilt (*Neocosmospora vasinfecta*) [*Fusarium vasinfectum*], flax wilt (*F. lini*), cabbage club-root [*Plasmodiophora brassicae*], and many others, some of which have been noticed in this *Review*.

BORCHHARDT (A.). **Arbeiten der phytopathologischen Abteilung der Landw. Versuchsstation im östlichen Steppengebiet (Gouv. Jekaterinoslaw) im Jahre 1925.** [Operations of the phytopathological section of the Agricultural Experiment Station in the eastern Steppe region (Ekaterinoslaff Government) in the year 1925.]—Dniepropetrovsk (Ekaterinoslaff), pp. 3–37, 1927. (Russian.) [Abs. in *Bot. Centralbl.*, N.S., xi, 13–14, pp. 440–441, 1928.]

The artificial inoculation of *Setaria germanica* [*S. italica*] with oospores of *Sclerospora graminicola* kept for ten years in the

laboratory resulted in 77·7 per cent. infection. The inoculation of wheat and barley gave negative results, while only the conidial stage of the fungus developed on millet [? *Panicum miliaceum*].

CUNNINGHAM (G. H.). **New Zealand: activities in field of plant pathology in 1927.**—*Internat. Bull. of Plant Protect.*, i, 10, pp. 157–158, 1927.

An inspection of the chief cereal growing areas of New Zealand in January, 1927, showed that rusts, though general, had appeared late and caused little damage. *Puccinia triticina* was common on wheat, but *P. graminis* both on wheat and oats was limited to a few local areas. *P. coronata* [*P. lolii*] was general on the latter crop, and *P. anomala* [*P. simplex*] on barley. Wheat bunt (*T. levis* and *T. tritici*) was present on 18 per cent. of the crops, but owing to seed treatment the highest infection found was only 5 per cent. *Ustilago tritici* was prevalent on wheat, up to 12 per cent. being found on White Straw Tuscan. As few growers disinfected their seed, *U. jensenii* [*U. hordei*] was general on barley in amounts ranging from approximately 0·1 to 12 per cent.

In 10 per cent. of the cereal crops examined a trace of *Ophiobolus graminis* was found, and in 5 per cent. *Gibberella saubinetii* was present, sometimes infecting 30 per cent. of the plants. A foot rot of oats, wheat, and barley due to *Fusarium* spp. caused the condition known as white-head. *Septoria graminum* was found on wheat and oats, and *Erysiphe graminis* on 12 per cent. of the spring-sown wheat and on three barley crops.

SMALL (W.). **Report of the Mycological Division.**—*Ceylon Administration Reports for 1926*, pp. D 19–D 20, 1927.

In this report it is stated that examples of the supposed physiological die-back of tea shoots in Ceylon proved to be cases of *Rhizoctonia* root disease (*R. bataticola*) [*Macrophomina phaseoli*: *R.A.M.*, vii, p. 62]. Disease and death of young tea and of seedlings in nursery beds were traced in some cases to this fungus, in others to the same associated with *Poria*, and in others again to the attacks of eel-worms (*Heterodera radicicola*).

Root disease of *Hevea* rubber trees was prevalent, and in several cases evidence was obtained that the primary injury was due to *R. bataticola*, while *Fomes lignosus*, *F. lamaoensis*, *Ustulina* [*zonata*], and *Diplodia* [*Botryodiplodia theobromae*] were secondary parasites. The die-back of rubber associated with the last-named fungus was also found in several cases that were carefully examined to be in reality due to *R. bataticola*.

A leaf disease of coco-nut was observed, associated with a species of *Pestalozzia* and *Mycosphaerella gastonis*. The disease of rice due to *Sclerotium oryzae* occasionally proved very harmful. *R.* [*Corticium*] *solani* was found to be associated with a rice disease. Tomato roots were attacked by *R. bataticola* and tobacco by *Bacterium solanacearum*.

In the reports of the plant pest and disease inspectors [pp. D 23–D 27] it is stated that bunchy top of plantains [*Musa paradisiaca*] in most cases shows signs of diminished severity in Ceylon.

Bunting (R. H.). **Extracts from records of the Mycological Division 1926.**—*Year-Book Dept. of Agric., Gold Coast, 1926* (*Bull.* 7), pp. 23–24, 3 pl., 1927.

Lime trees in the Central Province, Gold Coast, were affected during 1926 with a red root disease associated with the conidial stage and rhizomorphs of a species of *Sphaerostilbe*, thought to be *S. repens*. Conidial fructifications, rhizomorphs, and perithecia of the same fungus were also found in masses on a heap of decomposing lime fruit. Severe die-back of lime trees was associated with numerous saprophytes and one attack was due, apparently, to a species of *Diplodia* which differed from *Botryodiplodia theobromae* in spore measurements. Other new records include *Thielaviopsis paradoxa* on coco-nut, *Ganoderma lucidum* on cassava, a species of *Macrophoma* on cacao pods, and *Mycosphaerella* (?) *gossypina* on cotton leaves.

Campbell (J. G. C.). **Report by Government Mycologist.**—*Ann. Rept. Fiji Dept. of Agric. for the year 1926*, pp. 3–4, 1927.

The Queensland leaf spot of bananas has been shown to be identical with the Fiji leaf spot [*R.A.M.*, v, pp. 169, 715], both being similar to a leaf spot occurring in Java, Ceylon, and elsewhere. *Cercospora musae* was isolated from infected material and found to be a very slow growing organism, both in culture and on the plant. The fungus described as *C. musae* by Massee is stated to be identical with that described several years earlier by Zimmermann under the same name, from Java. Growth on the host is favoured by warm temperatures and a high degree of humidity. Bordeaux mixture spreads and adheres to banana foliage better than lime-sulphur or copper-lime dust, and arrangements should be made for testing this preparation against the leaf disease. *C. musae* has been observed to prepare an entry for the anthracnose fungus (*Gloeosporium musarum*), which may destroy large areas of the leaf surface. Both fungi thrive under similar conditions. Cleanliness in the plantation is essential to the control of anthracnose, which is believed to occur on certain weeds, e.g., *Mikania scandens*, frequently found among bananas.

Soft rot of pineapple (*Thielaviopsis paradoxa*) caused considerable losses in certain consignments sent to the canning factory. The fruit was apparently attacked in the cavities left at the base on wrenching the pineapples from the plant. Fruit should be cut and not pulled from the stalk.

Fruitlet rot of pineapples, found particularly in consignments from two districts, is characterized by a blackish discoloration of the tissues surrounding the eyes. This disease occurs in the West Indies, where it is attributed to a species of *Penicillium* or, more recently, to a bacterium [ibid., iv, p. 528; v, p. 618].

Leaf spot and blossom blight of mango [*Mangifera indica*], caused by *Gloeosporium* sp. [cf. ibid., vii, p. 185], are common round Suva and in wet districts generally. The flowers die before setting fruit or the newly-formed fruits are attacked and fall off. It has been shown in other countries that this disease is controllable by the application of Bordeaux mixture.

Rubber pods from Samoa were found to be infected by *Phytophthora faberi.*

WALTERS (E. A.). **Report on the Agricultural Department, St. Lucia, 1926.**—29 pp., 1927.

In the section of this report dealing with plant diseases (pp. 10–12), it is stated that gumming disease (*Bacterium vascularum*) [*R.A.M.*, vi, p. 79] was found on several sugar-cane estates, the varieties affected being BA 6,032, Sealy Seedling, Bourbon, B 11,569, and B 149 The chief symptom was pale yellow or whitish streaks in the leaves, especially in young shoots rising from the stool. Planters were advised to substitute resistant varieties, and to shorten the ratoon age by more frequent planting.

Wither-tip of limes (*Gloeosporium limetticolum*) was noted in March, 1927.

The detection of Panama disease of bananas (*Fusarium cubense*) led to the destruction of 904 stools of the susceptible Gros Michel variety in a banana-growing area of 700 acres. With few exceptions, the disease is confined to the older estates; infected plantings become unproductive in about three to four years. The planting of disease-free sections only [loc. cit.] has greatly reduced the number of early infections and allows three years' more productivity than the old system. In planting new forest land the use of this system has reduced infection from about 1 per 100 to 1 per 1,000.

Diseases which are notifiable under the Plants Protection Ordinance include Panama disease and *Marasmius* disease [*M. semiustus*] of banana, wither-tip of limes, bud rot of coco-nut [*Phytophthora palmivora*], and gumming disease of sugar-cane.

HASKELL (R. J.) & WOOD (JESSIE I.). **Diseases of vegetable and field crops in the United States in 1926.**—*Plant Disease Reporter, Supplement* 54, pp. 209–333, 3 maps, 1927. [Mimeographed.]

Among the many interesting items in this report, which is arranged on similar lines to those of previous years [*R.A.M.*, v, p. 597], the following may be mentioned. Short summaries are given of the present position of potato seed certification, spraying and dusting, and seed treatment. No extension of the areas infected by wart disease (*Synchytrium endobioticum*) in Pennsylvania, Maryland, and West Virginia was reported to the Plant Disease Survey during the year. Powdery scab of potatoes (*Spongospora subterranea*) was reported only from Washington State. Root rot (*Phymatotrichum omnivorum*) was observed for the first time on potatoes in the lower Rio Grande Valley, destroying 4 to 10 per cent. of the crop.

Ashy stem blight of beans (*Macrophoma* [*Macrophomina*] *phaseoli*) [ibid., vii, p. 53] was reported from South Carolina, Georgia, and Mississippi, causing heavy losses (up to 65 per cent.) in the last-named State.

Peppery leaf spot of cauliflower (*Bacterium* [*Pseudomonas*] *maculicolum*) [ibid., iii, p. 565] is reported to be increasing in importance in the San Francisco Bay region.

The leaves of horse-radish [*Cochlearia armoracia*] plants growing in a greenhouse in the District of Columbia were heavily spotted with circular to angular, water soaked, later pale brown to yellowish lesions. Yellow bacteria resembling, if not identical with, *Bact. campestre* [*P. campestris*] were isolated from the spots and their pathogenicity proved. In western Oregon the horse-radish crop was nearly ruined by a destructive disease which appears to be due to the sugar beet curly top virus.

Angular leaf spot of cotton (*Bact. malvacearum*) was very widespread both in the eastern and western States. Throughout Texas it occurred in an epidemic form.

Wildfire of tobacco (*Bact. tabacum*) was reported from Connecticut, Maryland, Kentucky, Florida, and Wisconsin; and angular leaf spot (*Bact. angulatum*) from Connecticut, Virginia, Florida, Kentucky, and Indiana. Bacterial leaf spot (*Bact. melleum*) [ibid., iv, p. 317] was reported on tobacco from Kentucky and Tennessee.

'Tuberculosis' of sugar beets, due to *Bact. beticolum* E.F.S., Brown, & Town., commonly confused with crown gall (*Bact. tumefaciens*), was prevalent in two localities of Colorado.

Notes are also given on the diseases of various other crops, including asparagus, beets, carrots, eggplant [*Solanum melongena*], groundnut [*Arachis hypogaea*], pepper (*Capsicum annuum*), and spinach.

[YOUNG (V. H.) & ROSEN (H. R.).] **Plant pathology.**—*Thirty-ninth Ann. Rept. Arkansas Agric. Exper. Stat. for the year ending June 30, 1927* (*Bull.* 221), pp. 25–29, 1927.

The work in connexion with the development of cotton strains resistant to wilt [*Fusarium vasinfectum*] was continued with 17 selections, Rowden, Acala, and Trice being included for comparison [*R.A.M.*, vii, p. 18]. The strain of Trice employed proved particularly susceptible, more than 85 per cent. of the stand being completely destroyed and practically all the plants affected. A local strain of Rowden was moderately resistant, while Acala was intermediate. Several of the wilt-resistant strains gave promising results, the loss with a selection of Cook being only 9 per cent. All the highly resistant strains appear to mature too late for Arkansas conditions, but serious losses can be avoided by the substitution of moderately resistant varieties, e. g., Rowden and Express, for the very susceptible ones grown at present. Further studies under controlled conditions on the relations between soil temperature and wilt showed that there is little or no development of infection above 34° C., below which point the disease makes rapid progress. Temperatures from 26° to 32° appear rather favourable for the development of wilt. High soil temperatures up to 40° promote rapid germination of cotton, but above 35° growth is ultimately retarded.

Preliminary investigations on the relationship of different pomaceous hosts to the overwintering of fireblight (*Bacillus amylovorus*) showed that the bacteria occur in the water-conducting tissue of the xylem as well as in the cortex. Vascular invasion was found to extend almost a foot below the margin of the visible canker. The

first spring infections on cankered apple trees occurred on the Maiden Blush, Yellow Transparent, and Jonathan varieties. A few pear infections were observed about a week later. These data suggest that blight may be carried over and first appear on certain apple varieties, though the organism probably hibernates on pears also.

The average potato yield in Arkansas is very low—between 60 and 70 bushels per acre. It was shown that production can be increased by 50 per cent. by covering the plants with wire screens to exclude leafhoppers, which are suspected of the transmission of certain degeneration diseases. In 1926 heavy and thorough applications of Bordeaux mixture effected an increase of 59 per cent. in the yield.

The causal organism of stem rot of rice [*Sclerotium oryzae*] is able to persist for a year or possibly more in the soil, but under certain cultural conditions it dies in a few months.

[CRAWFORD (R. F.).] **Biology.**—*Thirty-ninth Ann. Rept. New Mexico Agric. Exper. Stat. 1925–1926*, pp. 17–19, 1926. [Received November, 1927.]

The following items of phytopathological interest occur in this report. No definite correlation was found between the moisture content of the soil and the prevalence of Chilli pepper [*Capsicum annuum*] wilt [*Fusarium annuum* Leonian]. The plot irrigated at four-day intervals gave the highest percentage of wilted plants and the lowest yield per plant, while that watered at sixteen-day intervals gave the lowest percentages of diseased plants and the highest yield per plant.

Attempts to isolate an organism from the wood of apple trees affected by measles [*R.A.M.*, iv, p. 354] gave negative results.

Texas root rot [*Phymatotrichum omnivorum*: ibid., vi, p. 467] appears to be spreading and causing some loss to the cotton crop. It is reported to have caused heavy damage to locust [*Robinia pseud-acacia*] and other shade trees in the Pecos Valley. Sore shin [*Corticium solani*] was very severe on cotton seedlings in 1926, and a species of *Fusarium* attacked and killed cotton plants in the Rio Grande Valley.

TUCKER (C. M.). **Report of the Plant Pathologist.**—*Rept. Porto Rico Agric. Exper. Stat. 1926*, pp. 28–30, 1927.

In November, 1925, a campaign was instituted for the eradication of bud rot of coco-nuts (*Phytophthora palmivora*) along the western coast of Porto Rico [*R.A.M.*, vi, p. 665]. The preliminary survey revealed 127 groves (representing 2,608 acres) with 399 active cases of bud rot, which were destroyed during the early part of 1926. At the first reinspection of the infected area in April, 1926, 94 new cases of bud rot were found on 19 properties, the corresponding figures (not yet complete) for the third reinspection during the summer of 1926 being 50 and 15, respectively. A reinspection of the hat palm (*Sabal causiarum*) groves at Joyuda in August, 1926, showed 33 new cases of bud rot in addition to the 23 disclosed by the initial survey. This host appears to be more susceptible than the coco-nut to *P. palmivora*.

The F_1 hybrids resulting from crosses between the Duncan and Triumph varieties of grapefruit were heavily infected by scab [*Sporotrichum citri*], thereby supporting the conclusion of Winston and his collaborators [ibid., v, p. 30] that citrus hybrids are at least equally susceptible with the most susceptible parent.

CIFERRI (R.). **Notae mycologicae et phytopathologicae. Serie II, N. 1–15.** [Mycological and phytopathological notes. Series II, Nos. 1–15.]—*Riv. Patol. Veg.*, xvii, 9–10, pp. 209–294, 8 figs., 1927.

In this paper, the author includes many observations of phytopathological interest, mostly from the Dominican Republic.

A leaf spot of *Feijoa sellowiana* was found to be due to *Helminthosporium feijoae* n. sp., a Latin diagnosis of which is given. Other fungi parasitizing this host are *Catacauma feijoae* and *Schizothyrium hypodermoides*, both in Brazil.

In 1924, a species of *Gloeosporium* was found on the fruit of *Vanilla planifolia* in the Botanical Gardens, Pavia. Cultures from the affected parts gave only a sclerotial fungus. As a *Botrytis* determined as *B. cinerea* by Turconi [*R.A.M.*, iii, p. 427] was isolated from vanilla fruits in the same greenhouse in 1923, the author considers that the sclerotia obtained by him belong to Turconi's fungus. Inoculations gave positive results on the leaves and green fruits of vanilla, but those with *B. cinerea* isolated from *Musa ensete* failed. As there were other differences in the pathogenicity of the two fungi on various hosts, the author considers that on vanilla to be a distinct species and names it *Sclerotium vanillae* n. sp., a Latin diagnosis being appended.

In 1925–6 about 50 per cent. of the plants in a nursery in the Dominican Republic containing some 5,000 seedlings of *Artocarpus incisa* were destroyed by a *Phytophthora*, apparently *P. faberi*.

At Alba [Piedmont] the author observed soy-beans affected with anthracnose caused by an *Ascochyta* morphologically identical with *A. pisi* except that 20 per cent. of the spores were uniseptate. These spores germinated less rapidly and in smaller numbers than the normal ones, but the germ-tubes were similar from both. As *Phyllosticta rabiei*, which causes the anthracnose of *Cicer arietinum* [ibid., i, p. 353], differs from *A. pisi* mainly in having continuous spores, the author thinks that the one organism may be responsible for the similar diseases of peas, *Cicer*, and soy-beans, the septation of the spores varying according to the host.

Colletotrichum falcatum was found in cavities of sugar-cane stems attacked by *Diatraea saccharalis* in the Dominican Republic. The sporodochia in this position assumed a tuberculariaceous aspect and resembled those of *Volutella fusarioides*.

After referring to the investigations of Massey [*R.A.M.*, iv, p. 196] and others on *Bacillus carotovorus* and *B. aroideae*, the author states that inoculation experiments with a strain of the former isolated from rotted rhizomes of yautia (*Xanthosoma sagittifolium*) gave positive results on the original host as well as on *Colocasia antiquorum*, *Alocasia macrorrhiza*, *Caladium schomburghii*, *Zantedeschia aethiopica*, iris, hyacinth, gladiolus, and

carrot; it failed to infect onion, tomato, tobacco. potato, sweet potato, cassava, and various other hosts. The Araceae were among the most susceptible hosts of this strain, and the author concludes that there is a possibility that the two species mentioned above are identical.

A *Gloeosporium* was found on a leaf spot of mangosteen (*Garcinia mangostana*) from San Domingo City and is considered to be a new species which is named *G. mangostanae* n. sp. ad int., a Latin diagnosis being added.

Leptosphaeria theobromicola and *Septoria theobromicola* [ibid., vi, p. 259] were found as parasites of cacao (*Theobroma cacao*). *S. theobromicola* is considered the more important, but causes severe injury only when cultivation is defective. *Phyllosticta theobromae* forma *dominicana* [ibid., vi, p. 321] was also identified once on cacao, producing large spots which sometimes covered nearly half the leaf surfaces. The spots usually appear at the leaf margin, and are very irregular, chestnut-red or reddish-brown on the upper surface (sometimes edged with a blackish ring) and pale yellow below. In plantations in the vicinity of the Rio Yabon, where a withering and defoliation of the branches of cacao plants has been attributed to a species of *Monilia*, the author also found many plants showing similar symptoms, but with a general appearance more suggestive of root disease or unsatisfactory cultural conditions. *Monilia cinerea* was isolated from affected branches, but artificial infection experiments on fruits and branches of cacao gave negative results. In the author's opinion, the disease in question is not caused by *M. cinerea* but is a root disease. It has no relation to the *Monilia* pod rot of cacao occurring in Ecuador.

During heavy rains *Carica papaya* showed a soft rot of the leaves and a premature shedding of the young fruit, which was marked by a brownish-violet, subepidermal discoloration. *Thielaviopsis paradoxa* developed from affected material placed in a moist chamber, and inoculations with pure cultures gave positive results under very moist conditions on papaw and *Cucurbita moschata* fruits.

STAPP (C.). **Der bakterielle Pflanzenkrebs und seine Beziehungen zum tierischen und menschlichen Krebs.** [Bacterial plant cancer and its relations to animal and human cancer.]—*Ber. Deutsch. Bot. Gesellsch.*, xlv, 7, pp. 480–504, 4 pl., 1927.

In connexion with a comparative study of plant and animal cancer, the writer carried out a series of agglutination and precipitation experiments with a number of strains of *Bacterium tumefaciens* isolated from various hosts. The results of these tests [presented in tabular form] showed distinct serological differences between the various strains of the organism. Thus E. F. Smith's strain from hops differed serologically from all the others tested. The strain from *Chrysanthemum frutescens* (II b) agrees with several from apples and with one from vine, while the strain from peach differs from that of gooseberry, apple IV 2 b, and *C. frutescens*, but corresponds with the apple strain O. Notwithstanding these differences, the morphological and physiological agreement between the strains is such that the retention of the specific name *Bact. tumefaciens* for the entire group is advocated.

As regards the pathogenicity of these strains, all lost their virulence after five years or less in culture, except the hop strain, which has maintained its infectious character for fifteen years on a comparatively unsuitable medium, namely, bouillon agar. As already observed by Smith (*U.S. Dept. of Agric. Bur. Plant Indus. Bull.* 213, 1911), the majority of the colonies developing in a culture of *Bact. tumefaciens* from pear and apple tumours are completely non-pathogenic. These avirulent strains were shown to be in entire morphological and serological agreement with the pathogenic ones.

The remainder of the paper summarized the work of contemporary investigators on the cancer problem, a brief review being given of the various theories on the cause of cancer, especially of the recent researches of Blumenthal and his collaborators [*R.A.M.*, vi, p. 657] in the production of animal tumours with strains of *Bact. tumefaciens.*

BUNTING (R. H.). **Local cereal diseases in the records of the Mycological Division.**—*Year-Book Dept. of Agric., Gold Coast, 1926* (*Bull.* 7), pp. 25–27, 4 pl., 1927. [Received January, 1928.]

The frequent occurrence in the Gold Coast of *Acrothecium lunatum* on maize leaf spots which differ mainly in the presence of a translucent central spot from those caused by the conidial stage of *Ophiobolus heterostrophus* led to an attempt to test the possible pathogenicity of the former fungus. The results, however, were inconclusive. The same fungus was found on the glumes of sorghum and on sugar-cane leaves. Cultures from an ear rot of maize in which the upper part of the host had rotted away gave a species of *Fusarium* considered to be *F. moniliforme* [*Gibberella moniliformis*]. *Cephalosporium acremonium* was obtained in culture from the discoloured vascular bundles of an aborted maize cob. A few harvested ears of Hickory King maize at Kumasi bore greenish-grey to jet-black grains, in which the mycelium and pycnidia of *Botryodiplodia theobromae* were found; the shanks were infested with the same type of mycelium as that in the grains, indicating that infection had taken place by the cut end. The fungus caused the development of typical lesions when inoculated on cacao pods. A species of *Marasmius* believed to be as yet undescribed was recorded as parasitic on maize leaves.

The following fungi are stated to be new records for the Gold Coast: *Colletotrichum andropogonis* Zimm., *Puccinia* (?) *purpurea*, and *Sphacelotheca sorghi* on sorghum; a species of *Alternaria*, *Nigrospora oryzae*, and *Piricularia oryzae* on rice; *Phyllachora heterospora* on Guinea grass (*Panicum maximum*); a species of *Helminthosporium*, *Puccinia penniseti*, and *Tolyposporium penicillariae* on bulrush millet (*Pennisetum typhoideum*); a species of *Helminthosporium* and *Leptosphaeria sacchari* on sugar-cane; and *Diplodia macrospora*, *Epicoccum neglectum*, *H.* (?) *rostratum*, *H.* (?) *sativum*, *Papularia sphaerosperma*, *Phoma zeicola*, *Physoderma zeae-maydis*, *Puccinia maydis*, and *Ustilago zeae* on maize.

Webb (R. W.). **Soil factors influencing the development of the mosaic disease of winter Wheat.**—*Journ. Agric. Res.*, xxxv, 7, pp. 587–614, 1 fig., 7 graphs, 1927.

Experiments were conducted at Madison, Wisconsin, to ascertain the influence of soil temperature and soil moisture upon mosaic infection [*R.A.M.*, v, p. 85] of Harvest Queen and Currell winter wheats.

In the first series, seedlings were incubated in Wisconsin soil temperature tanks placed in the field, and after 30 days were transplanted. The results [which are tabulated and expressed graphically] showed that when seedlings were incubated at 10°, 16°, 23°, and 30° C., the disease occurred only at 10° and 16°. The leaf mottling in the Currell variety (which shows only this phase of the disease) was approximately equally marked at both temperatures, but with Harvest Queen rosette and leaf mottling both developed best at 16°.

High soil moisture (52 per cent. of the moisture-holding capacity) strongly favoured rosette and mottling, but no symptoms were observed when the soil moisture was low (30 per cent.). The optimum soil temperature for the development of mosaic was unaffected by changes in soil moisture, and vice-versa.

Under field conditions, rosette developed at soil temperatures (weekly average, 10° to 16°) closely approximating to those found most favourable under the controlled conditions in the tanks ; faint mottling developed in both varieties at rather higher soil temperatures (weekly average, 21°).

When seedlings were transplanted into uninfected from infected soil, rosette developed only at a soil temperature of approximately 16°. Surface sterilization of the subterranean parts of infected seedlings by steeping for five minutes in 0·1 per cent. solution of mercuric chloride at the time of transplanting reduced the occurrence of rosette, especially in the younger seedlings, and in 1-week-old seedlings it entirely prevented the disease. Leaf mottling, however, was often more common in the sterilized plants.

Roussakoff (L. F.). Ржавчина хлебов в Дальне-Восточном Крае по данным анкеты за **1925** г. [Cereal rusts in the Far East according to the data obtained from an inquiry in 1925.]—*Материалы по Микологии и Фитопатологии* [*Materials for Mycol. and Phytopath.*], Leningrad, vi, 1, pp. 96–122, 2 maps, 1927.

This report embodies the results of an inquiry made in 1925, prior to the author's personal investigation of the cereal rusts problem in the Amur region [*R.A.M.*, v, p. 539], by means of questionnaires sent to several hundred correspondents over the whole Russian Far East, including the Transbaikal, Amur, and Primorskaya [Pacific Coast] provinces of Siberia. The general consensus of opinion was that stem rust (*Puccinia graminis* f. *tritici*) and brown leaf rust (*P. triticina*) of wheat are of far greater economic importance than the rusts of other cereals, partly owing to the fact that this crop is the one most widely grown (the total area under wheat in 1925 was about 650,000 acres), and partly to the severity of the annual damage, especially in certain years.

such as 1923, when frequently whole fields were left standing unharvested, as the grain was reduced to mere husks and the straw was so weakened and broken up as to be useless.

The rusts attain their greatest intensity of attack in those districts of the Amur and Primorskaya regions which chiefly grow wheat. The first to appear in the spring is generally brown rust of wheat, but the greatest damage is done by stem rust. Of interest is the fact that in the southern part of the Primorskaya region, where the alternate hosts of the rusts are abundant and carry the infection over the winter, the diseases spread in the spring much more gradually than more to the north and in the Amur region, where infection occurs suddenly over wide areas and at once attains a high degree of intensity. The inference is that in these latter regions the crops are infected directly by uredospores carried by the wind from North Manchuria and the south of the Primorskaya region [see next abstract]. In the Transbaikal region, the rusts again spread slowly, a fact which is correlated with the considerable distance that separates this area from the rust foci in the south, since widespread epidemics in Manchuria and the Amur region frequently fail to reach it; it is also believed to indicate the existence in the Transbaikal of local sources for re-infection in the spring.

Lodging of the wheat due to the stem rust was reported by about one half of the correspondents in the Amur and Primorskaya regions, and occurred much more rarely in the Transbaikal; tall wheats on well manured soils were observed to be more liable to lodging than lower stands. Contrary to expectation, only 73 per cent. of the correspondents noted premature ripening of the wheat consequent on rust attack, this effect having been recorded much more frequently in the south than in the north. In the great majority of reports the appearance of the rusts was ascribed to fogs, or, less often, to morning dews. No correlation could be established between the time of appearance of the diseases and the amount of damage done by them. A few reports were received indicating that good results were obtained in preventing infection of the crops by shaking off the dew from the wheat early in the morning, this being done by two men dragging a rope over the tops of the plants. Locally the Strube (Kubanka) variety of wheat is considered to be the most resistant to both rusts, the Amur awnless variety coming next.

SHITIKOVA-ROUSSAKOVA (Mme A.). Вопрос о заносе ржавчинной инфекции в Амурскую область. [On the question of how rust infection is introduced into the Amur Region.]—*Материалы по Микологии и Фитопатологии* [*Materials for Mycol. and Phytopath.*], Leningrad, vi, 1, pp. 13–47, 2 figs., 1927.

The author's investigation was made during the summer months of 1926 at the Amur Regional Agricultural Experiment Station near Blagoveshtshensk [east Siberia] for the purpose of eliciting the source of the rust fungi that annually attack cereal crops in the Amur Region [see last abstract]. As pointed out by Roussakoff [*R.A.M.*, vi, p. 718] and as confirmed by further observations, local conditions and more particularly the extremely cold winters render

very remote the possibility of the rusts overwintering in the region and renewing the infection in the spring. All the evidence tended to show that the crops are infected by wind-borne spores from North Manchuria and the Coastal [Pacific] province, where the rusts are known to be endemic and where the existence of numerous barberry bushes ensures an abundant production of aecidiospores in the spring.

Spore-catching apparatus [a brief description of which is given] were fixed at heights of 1, 2, 4, and 6 m., and their contents were examined twice daily during the whole period of the work. The results indicated that a maximum of spores and other small particles, e.g., pine pollen, is carried at a height of about 4 m. above the ground. The first test was made on 16th June, and showed the presence in the air of a small number of aecidiospores, a small portion of which may have belonged to *Puccinia triticina*, as local species of *Thalictrum* were found to bear aecidia of the fungus; the appearance of these plants indicated that they had become infected about the 10th June, following a period of south-easterly winds. The infection of *Thalictrum* was, however, sporadic and very slight, owing to the prevailing dry conditions. The fact that numerous sunflower plants were found to bear well-developed aecidia of *P. helianthi* made it probable that most of the aecidiospores present in the air belonged to this species. These observations lead to the conclusion that in 1926 the local production of aecidiospores of *P. triticina* was very slight and could not be responsible for the subsequent widespread infection of wheats in the region with brown rust. The first scattered uredosori of this fungus were found on wheat on 28th June, while the first uredospores in the air were observed on 19th June. The condition of the uredosori together with the meteorological data indicated that the wheats were infected in the night of 16th June, immediately following two or three days of south-easterly wind which, presumably, brought the infective material from North Manchuria; another similar infection also occurred during the night of 23rd June. Noteworthy was the fact that, as on the days following this last date the wind veered to the south-west and then to the north-west, the uredospores entirely disappeared from the air; but they reappeared on the 27th when the wind again blew from the south-east.

During the whole of this initial period, the number of aecidiospores found in the air was rather low and fairly constant, a fact which the author correlates with the severe drought which was then prevalent in Manchuria; as the summer advanced, however, the number of the uredospores rapidly increased, to reach a maximum during the week from 28th July to 4th August, when practically all the wheat plants in the fields were rusted. It was also noted that the number of the spores was higher in dry weather than in wet, and during the day than during the night. Later in the season the spores were found to come no longer from the south-east but from the north, where rainy conditions prolonged the disease and enhanced its severity.

The first uredosori of *P. graminis* on wheat were found on 23rd July, their aspect indicating their appearance a few days

earlier, while the first uredospores of this species were found in the air on 12th July, during a strong south-easterly wind and when conditions of atmospheric moisture rendered infection most likely. On the whole, the same remarks apply to the further development of this species as in the case of *P. triticina*. A point stressed is the early appearance (end of June) in the air of very large numbers of teleutospores (the great majority of which presumably belonged to *P. triticina*, *P. graminis*, and *P. helianthi*), which was maintained throughout the whole season; this feature appears to be quite characteristic for the Far East, since it has not been noted elsewhere, and it is believed to have a considerable significance, by ensuring a constant re-infection of the secondary hosts in those districts where they occur and are known to carry the rusts over winter, in the severe outbreaks of the rusts that occur there year after year and frequently entirely annihilate the crops.

Some notes are also given on the occurrence in the air of spores of species of *Helminthosporium*, *Alternaria*, and *Ustilago*.

NEWTON (MARGARET) & JOHNSON (T.). **Color mutations in Puccinia graminis tritici (Pers.) Erikss. and Henn.**—*Phytopath.*, xvii, 10, pp. 711–725, 1 col. pl., 1 fig., 3 graphs, 1927.

Two colour mutations, a bright orange and a greyish-brown, have been observed in the uredo stage of *Puccinia graminis tritici* on wheat. The former originated in a collection from Rosthern, Saskatchewan, which for six generations previously had appeared to be a pure culture of physiologic form 9 [*R.A.M.*, ii, p. 358], producing uredospores of normal colour. The latter appeared in the first generation of uredospores in a culture derived from aecidia on *Berberis vulgaris*. No change is apparent in the infection capabilities of the two mutants as judged by the reaction to infection of the twelve standard differential host varieties. The uredospores of both mutants are binucleate and markedly shorter than those of the normal rust. They also show lower germination percentages (61·24 in the orange and 53·16 in the greyish-brown, compared with 86·32 in the normal rust). The spore walls of the orange mutant are hyaline while those of the normal rust and the greyish-brown mutant are coloured. On the other hand, the cytoplasm of the orange and normal spores is coloured, while that of the greyish-brown ones is almost colourless. Carotin is believed to occur in the normal and orange spores, while the normal and greyish-brown spores appear to contain an unidentified compound producing a reddish-brown tint.

SINNING (A.). **Eignet sich die Trockenbeize ebensogut wie die Nassbeize zur Bekämpfung aller Getreidekrankheiten?** [Is dusting as effective as liquid disinfection in the control of all cereal diseases?]—*Deutsche Landw. Presse*, liv, 40, p. 546, 1 fig., 1927.

The comparative merits of liquid disinfection and dusting for the control of fungous diseases of cereals, other than those for which the latter have been officially recommended by the German Plant Protection Service, are briefly discussed in the light of recent experiments. These last do not include stripe disease of barley

[*Helminthosporium gramineum*], but in 1925 this disease was reduced in Schneider's experiments from 8·3 to 0·01, 0·3, and 0·27 per cent., respectively, by tillantin dust and two commercial mercurial compounds, all applied at the rate of 3 gm. per kg. of seed-grain. Excellent results in the control of stripe disease have also been obtained by Spieckermann in Westphalia by dusting with tillantin (formerly höchst), while in the writer's own experiments the same preparation reduced infection by *H. gramineum* from 35·7 to 0·5 per cent. Infection in the plots treated with abavit B amounted to 20·25 per cent. Tillantin dust possesses the further advantage over abavit B of being non-corrosive to iron.

MOLZ (E.). **Zu den Ausführungen Dr. A. Steindorff's in Nr. 5 des 'Pflanzenbau', 4. Jahrg., S. 78.** [Notes on Dr. A. Steindorff's statements in *Pflanzenbau*, iv, 5, p. 78.]—*Pflanzenbau*, iv, 7, pp. 111–112, 1927.

This is a further contribution to the discussion on the respective merits of the disinfectant dusts, tillantin and abavit B [*R.A.M.*, vi, p. 722].

TORSSELL (R.). **Om liggsäd vid den mellansvenska höstsädesodlingen.** [On lodging in the autumn cereal crops of Central Sweden.]—*Landtmannen*, x, 44, pp. 874–875, 1927.

Both wheat and rye in Central Sweden were widely attacked during the damp and sunless summer of 1927 by the strawbreaker fungus (*Leptosphaeria herpotrichoides*), the mode of infection and control of which are briefly described [*R.A.M.*, vii, p. 87].

ROJDESTVENSKY (N. A.). **Спорынья. Сводка современных данных о спорынье.** [Ergot. A summary of present knowledge regarding ergot.]—*Материалы по Микологии и Фитопатологии* [*Materials for Mycol. and Phytopath.*], vi, 1, pp. 123–165, 1927.

This is a comprehensive review of the knowledge acquired since ancient times up to the present of the diseases of Gramineae known under the name of ergot, with particular reference to that of rye (*Claviceps purpurea*). In regard to the latter, a detailed description [based on the work of other authors] is given of the symptoms on rye, and of the morphology and biology of the causal fungus, together with a full synonymy. A list is also given of all the plants so far known to be attacked by ergot. The chemical composition of the sclerotia on rye is dealt with at length, and a chapter is devoted to the pathological effects on men and animals caused by the consumption of food contaminated with sclerotia. A widespread epidemic of ergotism is stated to have occurred in 1926 in several districts of East Russia, during which a successful curative method is said to have been elaborated, consisting in intravenous injections, at intervals of one or two days, of 5 to 25 c c. of a solution [concentration not indicated] of sulphate of magnesium.

In discussing control measures, the author particularly recommends the collection in the fields of the sclerotia, for which there is an extensive demand both in Russia and abroad, and which locally command a price of 1.50 roubles [3 shillings] per lb., while

the current market price of rye is Rbs. 1.50 per pood [36 lb.]. Rye seed should also be carefully freed from the sclerotia. An effective method for this end, now widely used in practice in Russia, consists in plunging the seed into a 30 to 35 per cent. solution of sodium or potassium chloride (the latter is stated to be preferable, since it does not injure the germination of the seed), when all the impurities in the seed, including the sclerotia, float to the surface and can be easily skimmed off.

A bibliography of 47 titles is appended.

APPEL [O.]. **Der Maisbrand und seine Bekämpfung.** [Maize smut and its control.]—*Deutsche Landw. Presse*, liv, 43, p. 596, 1 col. pl., 1927.

A brief, popular account is given of the symptoms of maize smut (*Ustilago zeae*), which is stated to occur only to a limited extent in Germany. In view of the increasing importance of maize as a fodder crop, it is very desirable that the incidence of this disease should be still further restricted, and it is suggested that the certification standard, which at present permits 2 per cent. of smut infection in the field, should be raised. The importance of removing the smut balls at an early stage is emphasized.

GESCHELE (E.). К биологии **Ustilago reiliana Kühn.** [Contribution to the biology of *Ustilago reiliana* Kühn.]—*Morbi Plantarum*, Leningrad, xvi, 2, pp. 150–155, 2 figs., 1927.

In this paper, an abstract of which has already been noticed [*R.A.M.*, vi, p. 723], the author points out the lack of biological information concerning *Ustilago reiliana* [*Sorosporium reilianum*], in spite of the almost cosmopolitan distribution of this fungus as a parasite of sorghum, Sudan grass [*Andropogon sorghum* var. *sudanensis*], and maize, and of its considerable economic importance. The experiments briefly reported in this paper were made in 1926 at the Dniepro-Petrovskaya Regional Agricultural Station [south-west Russia], following an epidemic outbreak of the fungus on maize in the neighbourhood of the Station, where from 20 to 30 per cent. of the male inflorescences were found to be heavily attacked. The results of the tests, in which artificially infected seeds of two named varieties of maize produced 13·6 and 10·3 per cent. of smutted plants, respectively, indicated that infection occurred during the germination of the seed. In 45 per cent. of the diseased plants only the male inflorescences were attacked, in which case the plants were lower than the controls (averages 34·3 and 45·5 cm., respectively), and either no ears were produced or they remained in an embryonic stage and were also infected. The male inflorescences were infected only in part; total infection was rare and was only found in very stunted individuals. In the other 55 per cent. of diseased plants, the development of the plants was normal except for the ears. In the great majority of cases all the ears on these plants were infected, but occasionally those higher up were healthy and only the lower were smutted. The smutted ears varied considerably in size, sometimes equalling the normal ones. Not infrequently the infection of the ears was only partial. Very often secondary ears were formed on the rachis of the smutted ear,

the whole being wrapped in the normal envelopes, so as to produce the impression of only a single ear. No sori of the fungus were noted either on the leaves or the stems.

A very brief description is given of the morphological characters which distinguish *S reilianum* from *Ustilago zeae*, the chief of which are the colour and size of chlamydospores, the presence on the latter in *S. reilianum* of dense spines, the fact that this species does not produce galls like those of *U. zeae*, and the dryness of its sori, those caused by *U. zeae* being always moist.

It is pointed out that *S. reilianum* brings out very clearly the atavistic characters of maize, and is much better adapted than *U. zeae* as an indirect means for studying the phylogeny of this plant.

MELCHERS (L. E.). **Studies on the control of Millet smut.**—*Phytopath.*, xvii, 10, pp. 739–741, 1927.

The tabulated results of two years' experiments in the control of smut (*Ustilago crameri*) of Italian millet (*Chaetochloa* [*Setaria*] *italica*) showed that the most effective liquid treatments are formaldehyde, copper sulphate, and uspulun. The first-named is undesirable on account of its injurious effect on germination. The most effective and economical dust is copper carbonate, applied at the rate of at least 4 oz. per bushel, which may be recommended as an efficient substitute for liquid disinfectants. Various sulphur dusts, Bayer dust, and colloidal copper dust are stated to be less satisfactory for the control of this smut.

FAWCETT (H. S.) & BARGER (W. R.). **Relation of temperature to growth of Penicillium italicum and P. digitatum and to Citrus fruit decay produced by these fungi.**—Abs. in *Phytopath.*, xvii, 10, pp. 746–747, 1927.

On culture media as well as on orange fruits the blue and green citrus moulds, *Penicillium italicum* and *P. digitatum*, appear to have nearly the same optimum temperature for development. *P. digitatum*, however, showed a greater difference than *P. italicum* between the growth rate at the optimum and that at the higher and lower temperatures. Decay was generally much more rapid, and also more frequent, at the stem end than at the stylar end of oranges Nearly all the fruit in samples inoculated with *P. italicum* and held at 66·8°, 74·8°, and 80·6° F. began to decay in four days, while those held at 86° and 57·5° kept for eight days, and at 50° for twelve days. Similar general relations were observed in respect of *P. digitatum*, except that temperatures above and below the optimum had a greater relative inhibiting effect than with *P. italicum*.

REICHERT (I.). **Damping-off in Citrus seed-beds.**—*Yedeoth* (*Proc. Zionist Executive Agric. Exper. Stat.*), iv, pp. 165–166, 1927. [Hebrew, with English summary.]

Species of *Fusarium*, *Rhizoctonia*, and *Alternaria* have been isolated from citrus seedlings suffering from damping-off in Judaea, Samaria, the Valley of Jezreel, and other parts of Palestine. Control measures should include relatively late sowing; the use of

light, cold soil for the seed-bed; the provision of ample light and air; the reduction of humidity by discontinuing watering, removing covers and spreading a layer of sand over the soil; and the preventive treatment of young seedlings with 0·5 per cent. Bordeaux mixture. Diseased seedlings and the adhering soil should be discarded and the rest of the infected soil treated with Bordeaux mixture. The remaining healthy plants should be disinfected with 5 per cent. Bordeaux mixture.

SAWADA (K.) & KUROSAWA (E.). **'Mompa' disease of Oranges.**—*Notes Dept. Agric. Res. Inst. Formosa*, 46, 21 pp., 2 pl., 1927. (Japanese). [Abs. in *Japanese Journ. of Botany*, iii, 4, p. (109), 1927.]

The 'mompa' disease of orange trees is characterized by a superficial growth on the branches, leaves, and fruits of a brown or purplish-brown mycelial crust, which arrests the development of the host and finally causes its death. The crusts may be readily detached and propagated by certain scale insects. The causal organism is a fungus with no spore formation, to which the name *Anthina citri* Sawada is given. Various methods of control are indicated.

SMEE (C.). **First report on pests and diseases of Coffee in Nyasaland.**—*Nyasaland Dept. of Agric. Bull.* 2, Entom. Ser., 3 pp., 1927. [Reprinted from *Ann. Rept. Dept. of Agric., Nyasaland*, pp. 17–19, 1927.]

Only a few observations have, as yet, been made on coffee diseases in Nyasaland. Seedlings in a nursery that had been over-watered were attacked by a *Fusarium* wilt, the spread of which was arrested by the application of Bordeaux mixture. A *Phoma* apparently similar to that occurring on tea [see below, p. 275], a *Pestalozzia* differing from the causal organism of grey blight of tea [*P. theae*], and a *Fusarium* have been found on young plants which were dying back as a result of neglect. The root disease due to *Armillaria* [*mellea*] has also been observed attacking the roots.

The physiological condition known as 'die-back' [*R.A.M.*, v, p. 298], following on the exhaustion of the bushes from various causes, is stated to be undoubtedly a serious problem in Nyasaland, especially during protracted spells of dry weather. In addition to improved cultural measures, the application of fertilizers will probably be necessary to restore the vitality of the weakened bushes.

MACCORMAC (H.). **Paronychia due to Oospora (Oidium) albicans.**—*Brit. Journ. of Dermatology*, xxxix, 10, pp. 394–398, 1 pl., 1 fig., 1927.

The occurrence of two cases of inflammation of the nail-fold (paronychia) in members of the same family is briefly recorded, with notes on previous references to a similar condition in pathological literature. In both the cases under observation the symptoms, which include a bolster-like swelling of the nail-fold and shedding of the nail, were found to be caused by *Oospora albicans*. The

development of this rare condition in two members of a family suggests either a common source of infection or the transmission of the disease from one to the other.

Pijper (A.) & Pullinger (B. Davidine). **An outbreak of sporotrichosis among South African native miners.**—*The Lancet*, ccxiii, 5435, pp. 914–915, 2 figs., 1927.

The writers have recently investigated the circumstances connected with an outbreak of sporotrichosis among fourteen natives working in a South African mine. The condition was found to be due to infection by *Rhinocladium* (*Sporotrichum*) *beurmanni* [*R.A.M.*, i, p. 352; iv, p. 283], the cultural and morphological characters of which are described. The administration of potassium iodide in the usual high doses gave beneficial results. This is stated to be the first record of sporotrichosis in South Africa.

Da Fonseca (O.), Leão (A. E. de A.), & Nogueira Penido (J. C.). **Mycose de typo ulcero-nodular, semelhando a esporotrichose e produzida por uma especie de cogumelo do genero 'Hormodendrum'.** [Mycosis of an ulcero-nodular type, resembling sporotrichosis and produced by a species of fungus of the genus *Hormodendrum*.]—*Sciencia Medica*, v, pp. 563–580, 2 pl., 1927. [Abs. in *Bull. Inst. Pasteur*, xxv, 23, p. 1050, 1927.]

Greenish, later black, colonies developed from the pus of suppurating, ulcerous, nodular, and cutaneous lesions, resembling those of sporotrichotic lymphangitis [see preceding abstract], on the hand and arm of a Brazilian aged twenty-three. The causal organism is regarded as a new species of *Hormodendrum*, and is named *H. langeroni*.

Da Fonseca (O.) & Leão (A. E. de A.). **Sur un cas d'acladiose à Acladium castellanii observé au Brésil.** [A case of acladiosis due to *Acladium castellanii* observed in Brazil.]—*Comptes rendus Soc. de Biol.*, xcvii, 31, pp. 1361–1362, 1927.

Acladiosis is stated to be an uncommon affection of the human skin which was first observed by Castellani in Ceylon in 1907. The pathogenic fungus isolated on this occasion was described by Pinoy in 1916 as a new species of *Acladium*, *A. castellanii*. Since then fresh cases have been studied in Ceylon, Macedonia, and Bangkok. The writers' patient, a forty-year-old Portuguese ragpicker, bore ulcerous lesions of the skin on the jaw and pre-sternal region. Isolations from the lesions developed on Sabouraud's medium a fungus which was identified as that named above. It formed smooth, shining, yellowish colonies composed of slender, hyaline, septate hyphae. Ovoid or elongated aleuria were formed along the mycelium or at the apices of the hyphae. No intercalary or terminal chlamydospores were detected.

Magarinos Torres (G.). **Histologie pathologique de l'acladiose.** [Pathological histology of acladiosis.]—*Comptes rendus Soc. de Biol.*, xcvii, 31, pp. 1362–1364, 1927.

In this paper the writer gives details of the histological changes

induced by the attack of acladiosis [due to *Acladium castellanii*] described above [see preceding abstract]. In addition to acute inflammation in the region where the epidermis had been destroyed, chronic inflammation was detected in the papillary body of the dermis, which contained giant cells and endothelial leucocytes forming a more or less diffuse infiltrate.

DAUBNEY (R.). **Bovine lymphangitis, or tropical actinomycosis.**—*Journ. Comp. Path. & Therapeutics*, xl, 3, pp. 195–216, 8 figs., 1927.

Four cases of bovine lymphangitis are described. From three of the four affected animals it was possible to demonstrate the presence of an acid-fast species of *Actinomyces* in smears of pus from the lesions. The organism, which was found to be identical with *A. farcinicus* (Nocard, 1888), was obtained in pure culture and a typical case of the disease was reproduced in one of two bulls inoculated with it. Lesions similar to those described by Nocard were also produced in guinea-pigs by inoculation.

WILENCZYK (A.). **Le Trichophyton en goutte pendante.** [*Trichophyton* in a hanging drop.]—*Ann. Inst. Pasteur*, xl, 8, pp. 732–742, 7 figs., 1926.

The author has observed three modes of reproduction in various species of *Trichophyton* cultures in Sabouraud's liquid medium in hanging drops at 36° to 37° C. (1) The fusion of mycelial hyphae resulting in the formation of spherical or oval, yellowish bodies. (2) The production of conidia united in groups, which in turn give rise to the above-mentioned bodies. (3) The transformation of isolated conidia or mycelial cells into spherical or oval bodies containing a nucleus (chlamydospores). All these types of reproduction are considered to be initial stages of ascus development. In order to bring these rudimentary asci to maturity special conditions are necessary. Mature asci of *T. crateriforme*, *T. plicatile*, and *T. cerebriforme* were obtained by repeated sub-culturing (8 to 10 generations) in Sabouraud's medium. In the early stages the cultures should be kept very moist, but after 10 to 15 days the humidity should be reduced to a minimum.

WILENCZYK (A.). **Sur la formation d'asques dans le Trichophyton (deuxième mémoire).** [On the formation of asci in *Trichophyton* (second memoir).]—*Ann. Inst. Pasteur*, xli, 12, pp. 1351–1356, 6 figs., 1927.

The author has conducted further studies on the development of asci in three strains of *Trichophyton granulosum* and one of *T. violaceum* [see preceding abstract]. The organisms were cultured on Sabouraud's medium at 37° C. for several weeks and then placed at room temperature. The yellowish or greenish, oval or elongated asci, containing two, four, six, or eight ascospores, developed mainly at the periphery of the cultures. Discussing the factors favouring the production of the perfect stage, the writer attributes the primary influence to an adequate supply of oxygen, an appropriate temperature, and the drying out of the medium.

WEDGWORTH (H. H.). **Gladiolus scab.**—*Quart. Bull. State Plant Board Mississippi*, vii, 3, pp. 6–10, 2 figs., 1927.

A brief, popular description is given of the symptoms of gladiolus scab (*Bacterium marginatum*) [*R.A.M.*, iv, p. 286], experiments in the control of which were carried out at the Mississippi Experiment Station during 1927. The best results were given by the immersion of the corms in a solution of semesan (1 in 400) or corrosive sublimate (1 in 1,000) for 12 hours or 30 minutes, respectively. The incidence of badly scabbed corms was reduced from 35·2 to 2·9 and 3·9 per cent., respectively, by semesan and corrosive sublimate. It is pointed out that the latter preparation is much cheaper, though less convenient than the former. One hour's immersion in corrosive sublimate is recommended as ensuring greater penetration than the shorter period.

NOVOUSPENSKY (S. P.). **Cylindrocephalum hyacinthi sp. nov. на цветах Гиацинтов.** [*Cylindrocephalum hyacinthi* n. sp. on Hyacinth flowers.]—*Morbi Plantarum*, Leningrad, xvi, 1, pp. 49–54, 1927. [German summary.]

A detailed description is given of the morphology and cultural characters of a fungus which, in 1918, was found in Leningrad attacking the living flowers of a hyacinth plant. The diseased flowers were filled with a white, fluffy mass formed of slender, interwoven, hyaline or slightly coloured hyphae, frequently united in bundles, and bearing numerous conidiophores and conidia. The conidiophores were light greenish-brown, tapering towards the apex, branching at frequent intervals, often with a septum at their base, and from 15 to 20 μ (in pure cultures up to 60 μ) long. The conidia, disposed spirally on the conidiophores, were subhyaline, continuous, cylindrical, rounded at both ends, and 6 to 7 by 1·5 to 2 μ in diameter, usually persistent on the conidiophore and occurring in radiating capitules of 4 to 10 (in culture up to 30) spores. The fungus was easily grown on various artificial media and developed luxuriantly on dead hyacinth flowers. It was found to belong to the genus *Cylindrocephalum*, but to differ in some details from the three species previously described; it is accordingly named *C. hyacinthi* n. sp., a Latin diagnosis being given.

The pathogenicity of the organism to hyacinth flowers was proved in inoculations made both on the bulbs and directly on the flowers. No other organs of the plants were attacked, and the inoculations gave positive results only when the plants were kept in a saturated atmosphere. The author considers the fungus to be a facultative parasite, which might become dangerous in poorly aerated and overcrowded hothouses.

RAM AYYAR (C. S.). **A bacterial soft rot of garden Poppy.**—*Mem. Dept. of Agric. India*, Bact. Ser., ii, 2, pp. 29–33, 3 pl. (2 col.), 1927.

Garden poppy (*Papaver rhœas*) plants at Pusa were observed in February, 1917, to be suffering from a rot characterized by external blackening and internal disintegration, accompanied by a discoloration of the midrib of the leaves. In advanced stages of the disease the plant exuded a slimy mass full of motile bacteria, which were

isolated and grown on nutrient agar plates poured from the dilute juice of the stems. Two kinds of growth developed after 24 hours' incubation at 30° C., namely, bluish, opalescent, circular colonies, and the greenish, fluorescent colonies of what appeared to be *Bacillus pyocyaneus*. Sub-cultures of the opalescent colonies were used for needle prick and scratch inoculations and gave positive results only on young, succulent plants kept under humid conditions. Inoculation tests on eggplant, *Datura*, and tobacco gave negative results, the only other plant successfully infected besides *P. rhœas* being the Mexican poppy (*Argemone mexicana*). A similar disease was observed in 1916 on opium poppies at Cawnpore, but in that case it was not possible to isolate the causal organism.

The poppy rot bacterium, to which the name *Bacillus papaveris* n. sp. has been given, is a short, actively motile rod, 0·5 to 2·5 by 0·35 μ, with rounded ends; Gram-negative, taking ordinary aniline stains well; peritrichiate with four to eight flagella. No spores or capsules could be demonstrated. Gelatine is liquefied, milk coagulated, and acid formed in peptone water with 1 per cent. glucose, lactose, sucrose, or glycerol. The optimum temperature for growth was found to be 30°, and the thermal death point between 56° and 60°. The organism remains viable on ordinary culture media for six or seven months at room temperature. The group number (in the chart of the Society of American Bacteriologists) of the organism, which is stated to differ from *B. aroideae* in its chromogenic character, is 221.2223522.

YOUNG (P. A.) & MORRIS (H. E.). **Plasmopara downy mildew of cultivated Sunflowers.**—*Amer. Journ. of Botany*, xiv, 9, pp. 551–552, 1 pl., 1927.

Downy mildew (*Plasmopara halstedii*) causes a severe dwarfing of sunflower [*Helianthus annuus*] seedlings, which bear abnormally thick, downward-curled leaves showing pronounced yellow and green epiphyllous mottling [*R.A.M.*, v, p. 670]. The white conidiophores and conidia develop over large areas on the under surface of the mottled regions.

Although definite evidence is lacking, it is almost certain that *P. halstedii* overwinters in diseased sunflower seeds. Affected seedling sunflowers showed the symptoms in a very severe form soon after the appearance of the first leaves, the plants usually dying before normal flowers matured and failing to produce viable seed. Occasional spots of downy mildew were observed in the upper leaves of large, otherwise normal plants in the field; possibly the seed is infected from this source. During the winter twelve White Beauty sunflower seedlings mottled with downy mildew developed from seed planted in a greenhouse in which there was no external source of inoculum.

No infection resulted from numerous inoculations of the unwounded upper surfaces of sunflower leaves in the field.

The characters of the mycelium in the stem and leaves are described. Hyphae measuring 4 to 30 μ (usually 8 to 12 μ) in diameter occurred between the thin-walled cells of some of the veins, and haustoria (2 to 27 μ, generally 2 to 14 μ) were present in some of the elongated cells forming the ends of the veins.

Sawada (K.) & Chen (C.-C.). **On the putrefaction disease of Antirrhinum majus.**—*Journ. Nat. Hist. Soc. Formosa*, xvi, pp. 199–212, 1926. (Japanese). [Abs. in *Japanese Journ. of Botany*, iii, 4, pp. (108)–(109), 1927.]

A description is given of a disease of the roots and base of the stem of *Antirrhinum majus* seedlings caused by a new species of *Pythium*, *P. spinosum* Sawada. The fungus, which was grown in culture in various media, forms conidia (germinating by germ-tubes, not by zoospores) and oospores. It was proved to be pathogenic to several other plants, including cucumbers, radishes, and onions. The optimum temperature for its growth is 30° C. Control measures are indicated. [This fungus is also described and figured in Sawada's recent paper on the Peronosporaceae of Formosa: see below, p. 273].

Pape (H.). **Blütenschäden bei Chrysanthemum.** [Damage to Chrysanthemum flowers.]—*Gartenwelt*, xxxi, 40, pp. 604–606, 2 figs., 1927.

Considerable damage to chrysanthemum flowers is often caused by grey mould (*Botrytis cinerea*). There appears to be little prospect of combating this disease by chemical means, though Crépin (*Journ. Soc. Nat. Hort. de France*, xi, p. 52, 1910) advocates the application of a 0·2 per cent. nitric acid solution shortly before the flowers open. Sanitary measures should include thorough ventilation and the avoidance of close planting, excessive watering, or heavy applications of nitrogen.

Pape (H.). **Die Septoria-Blattfleckenkrankheit der Chrysanthemen.** [The *Septoria* leaf spot disease of Chrysanthemums.] —*Gartenwelt*, xxxi, 47, pp. 720–721, 2 figs., 1927.

Severe damage was caused in Berlin and Hamburg nurseries during 1927 by the leaf spot disease of chrysanthemums (*Septoria chrysanthemella*) [*R.A.M.*, vi, p. 557]. The dimensions of the spores are given as 50 to 80 by 2 to 3 μ, and the diameter of the pycnidia as 150 to 250 μ [see also next abstract]. The disease [which is briefly described in popular terms] is stated to be promoted by defective lighting and ventilation, unduly close planting, and an excess of nitrogenous manure. Control measures should be based on an amelioration of these conditions, accompanied by repeated applications of Burgundy or Bordeaux mixture.

Hemmi (T.) & Nakamura (H.). **Studies on septorioses of plants. I. Comparison of different species of Septoria causing the leaf-spot diseases of the cultivated Chrysanthemum.**—*Mem. Coll. Agric. Kyoto Imper. Univ.*, 3, Art. 1, pp. 1–24, 2 pl., 4 figs., 1927.

Cultivated chrysanthemums in Japan, and probably elsewhere, are attacked by two different species of *Septoria*, namely, *S. chrysanthemella* Sacc., and *S. obesa* Syd.

The disease caused by *S. chrysanthemella* [see preceding abstract] is usually referred to as brown spot, leaf spot, or blight, but the writers think it should be known as black spot to distinguish it from the brown spot due to *S. obesa*. This last disease, which is

widely distributed in Japan and has also been observed in America, is characterized by the appearance of irregular or roughly elliptical, brown spots with indistinct margins on both leaf surfaces, those on the under side being lighter in colour. The lesions may converge to form large, irregular, somewhat shrunken, brown patches, extending from the margin to the centre of the leaf and sometimes along the veins. Affected leaves turn yellow and wither, frequently dropping as in black spot.

The morphological and cultural characters of both species are compared. The fungi are readily distinguishable, especially by the shape and dimensions of their spores. Those of *S. chrysanthemella* measure 23 to 72 by 1·2 to 3 μ, with 0 to 5 septa, and are filiform, straight or slightly curved, and of uniform width; while those of *S. obesa* are whip-shaped, thick and rounded at the base, tapering towards the apex, and measure 41 to 124 by 2·5 to 4.4 μ, with 4 to 12 septa. The pycnidia of *S. chrysanthemella* measure 53 to 148 μ in diameter and those of *S. obesa* 75 to 200 μ. *S. chrysanthemella* grows better at 32° C. than at 20°, while *S. obesa* makes little or no growth at 32°.

S. chrysanthemi-indici Bub. & Kab. has been regarded as a synonym of *S. chrysanthemella*, but the writers consider the identity of these two species as very questionable. *S. chrysanthemi-indici* is certainly different from *S. obesa* (parasitic on *C. arcticum*) from the description of the shape and dimensions of its spores (30 to 82·5 by 2 to 2·5 μ).

S. chrysanthemella and *S. obesa* were both shown by inoculation experiments to be pathogenic to healthy chrysanthemum leaves, the latter being more virulent and acting more rapidly than the former.

LUDWIGS [K.]. **Meltau an Hortensien.** [Mildew of Hydrangeas.] —*Blumen und Pflanzenbau*, xlii, 19, pp. 295–296, 1927.

Mildew of hydrangeas (*Oidium*) [*hortensiae*: see above, p. 223] has been recently reported from several parts of Germany. The disease appears to have been introduced two years previously from Belgium on the Matador variety and on one occasion each from Holland and France. A number of home-grown varieties appear to be susceptible, including Elmer, Loreley, America, Peer Gynt, Madame Mouillère, Schöne Perle, and twelve others; Heidenrösel and Parsifal are more resistant, while Niedersachsen, Gertrud Glahn, Schöne Dresdnerin, and Goliath are immune. The disease is reported to be controllable to some extent by dusting with erysit or spraying with vomasol S [Chemische Werke, Alfeld (Leine), Hanover]. The application of colloidal sulphur preparations, e.g., cosan, is recommended as likely to prove effective.

PAPE (H.). **Mehltau an Hortensien. Eine neue Seuche der Topfpflanzenkulturen.** [Mildew of Hydrangeas. A new blight of pot plant cultures.]—*Gartenwelt*, xxxi, 48, pp. 732–733; 50, pp. 759–760, 3 figs., 1927.

After a brief review of the distribution of hydrangea mildew [*Oidium hortensiae*: see preceding abstract], the writer describes

the symptoms of the disease. Severely infected leaves wither and die prematurely, and the inflorescences may be seriously injured.

The creeping hyphae bear on their short, erect, lateral branches, chains of elliptical or cylindrical conidia, the former measuring 37 to 45 by 16 to 21 μ, while the latter are longer and narrower.

The varieties Éclaireur, Elmer, and Loreley have shown the greatest susceptibility to mildew; twenty others are enumerated as moderately susceptible, while Gertrud Glahn, Goliath, Niedersachsen, and Schöne Dresdnerin appear to be immune.

LAUBERT (R.). **Die Fliederseuche.** [The Lilac disease.]—*Gartenwelt*, xxxi, 25, pp. 374–375, 1 fig., 1927.

Early in May, 1927, lilac bushes in Berlin developed a typical attack of *Pseudomonas syringae* [*R.A.M.*, v, p. 559]. The inflorescences turned blackish-brown and lost turgor, the young shoots had discoloured stripes of varying length, and the leaves were covered with dark, circular, sometimes confluent spots, 1 to 3 mm. in diameter. Often the midrib or petiole was also more or less discoloured, limp, and withered, while the growing leaves were slightly deformed and abnormally pale. The symptoms were particularly severe on the white-flowering varieties, but a number of other valuable bushes were also badly damaged.

PAPE (H.). **Eine neue Krankheit der Poinsettie.** [A new disease of Poinsettia.]—*Gartenwelt*, xxxi, 51, pp. 772–773, 2 figs., 1927.

Early in November, 1927, the writer received for inspection some poinsettia plants which were attacked by an apparently new disease of obscure origin, possibly belonging to the virus group. The leaf blades were strikingly distorted by the arrested growth of the portions bordering on the midrib, which led to asymmetrical development and to a swelling and curling of the affected parts. Diseased leaves were chlorotic in appearance and the veins were indistinct. In very severe cases the stems were also bent, and the youngest leaves showed pale, translucent areas. Both three-year-old mother plants and the current year's cuttings were attacked, about 10 per cent. of the entire stand being affected. The diseased plants were completely unmarketable.

WILLIAMS (R. D.). **Red Clover investigations, 1919–1926.**—*Bull. Welsh Plant Breeding Stat. Aberystwyth*, Ser. H, 7, 136 pp., 11 pl., 3 diags., 4 graphs, 1927. [Swedish summary.]

In the section of this bulletin dealing with the resistance of the different varieties of red clover to some of its most serious diseases, it is stated that clover sickness (*Tylenchus devastatrix* and *Sclerotinia trifoliorum*) is rare in Wales, and that no observations on resistance to this disease were possible.

All varieties grown at the Station, especially late ones, were susceptible to scorch or anthracnose (*Gloeosporium caulivorum*), the least susceptible being Cornish Marl, followed in order of increasing susceptibility by Montgomery, English late, Vale of Clwyd (early), and English broad red. Most susceptible of all were samples from Italy and southern France.

Leaf spot (*Pseudopeziza trifoliorum*) severely damaged the clover crops at Aberystwyth in 1923 and 1925. In trials made in 1923, the early varieties suffered most, the majority of the lower cauline leaves being killed off before the harvest. The least susceptible of the earlies were Vale of Clwyd (medium-early strain), American medium, and Bohemian; Italian, French, Swiss, and Silesian varieties were the most susceptible. No marked differences of susceptibility were noted among the late clovers.

Roberts (J. W.). **'Target canker' of Apples and Pears.**—*Phytopath.*, xvii, 10, pp. 735–738, 1 fig., 1927.

The disease described in this paper as 'target canker' of apples and pears was first observed by the writer in 1922 at Arlington Farm, Virginia, where the trunks and older branches of two apple trees were almost completely covered with circular dead areas containing concentric circles of fissures. In August of the same year, on the current year's growth of water-sprouts, young cankers developed from dark pustules to form a characteristic arrangement of concentric circular ridges which subsequently cracked open.

The cankers are confined to the cortical layers and become more superficial with age, owing to the formation of cork in the underlying tissues. On older twigs the cankers appear to start as raised pustules resembling those of measles [see above, p. 228]. The northwest side of the trees seems to be mainly affected. Some trees are seriously injured by the canker, but this result may be partly due to a previously enfeebled condition which predisposes them to the disease.

The varieties affected at Arlington comprised two 15-year-old French seedlings, two 20-year-old Jonathan, three eight-year-old Delicious, and one 16-year-old Grimes. Only two records of the disease on pear are known to the writer, one from Georgia on Kieffer and one from California.

Various reasons are given in support of the view that the disease is of non-parasitic origin. The relatively small number of cankers on vigorous individuals, their greater prevalence on the west and north sides of the trees, the frequent restriction of the cankered areas to certain limbs, and the apparently internal origin of the cankers all point in this direction. Moreover, no organism has been consistently isolated from the young cankers. Various species of fungi developed in 40 of the 96 cultures made from diseased material: *Physalospora malorum* [*P. cydoniae*] and species of *Coniothyrium* and *Alternaria* were mainly represented. No fungi have been found fruiting on the cankers, nor has mycelium been found in sections of young cankers. The possibility of their causation by insect punctures is not excluded.

Wolf (F. A.) & Bach (W. J.). **The thread blight disease caused by Corticium koleroga (Cooke) Höhn., on Citrus and pomaceous plants.**—*Phytopath.*, xvii, 10, pp. 689–709, 1 pl., 10 figs., 1927.

Since 1920 an investigation of a thread blight of grapefruit and orange, known locally as shoe-string disease, has been in progress at the Citrus Disease Field Laboratory, Orlando, Florida. This

paper reports the results of a combined study on this disease and the so-called hypochnose of apples and pears, which has been traced to the same source.

Thread blight has been observed by the writers on apple and pear in North Carolina and on pear, grapefruit, orange, pecan (*Hicoria* [*Carya*] *pecan*), and pomegranate in Florida. It has further been reported in the latter State on *Aleurites fordii*, *Sapindus utilis*, persimmon (*Diospyros virginiana*), pistachio (*Pistacia chinensis*), fig, Virginia creeper (*Ampelopsis* [*Parthenocissus*] *quinquefolia*), sour orange [*Citrus bigaradia*], and rose.

In the Okeechobee district of Florida thread blight occurs in a conspicuous form on isolated trees in the citrus groves throughout the rainy season (middle of June to end of September), while at other periods of the year it can only be detected on close inspection. The leaves, twigs, larger limbs, and fruit are involved.

The lower surfaces of the blighted leaves are partially or wholly covered in the early stages with whitish, powdery patches formed by the delicate, arachnoid hyphae and fructifications of the causal organism. Later the foliage exhibits large, indefinite, dead areas, the lower surfaces of which are covered by a brownish hyphal web. Contiguous affected leaves may become matted together by mycelium, and on detachment from the petiole they remain suspended by brown rhizomorphs, which can be traced from the sporophores backwards along the petioles to the twigs, and thence to the older wood. Chestnut-brown sclerotia are sparsely present on the current and previous year's twigs, which die back as the result of defoliation.

On the fruit the fungus develops a conspicuous, fibrillose, anastomosing mesh, the individual strands of which separate towards their extremity into simple hyphal filaments. The areas below these distal portions assume a scalded appearance, owing to the death and collapse of the rind tissues.

The hypochnose of apples and pears agrees in general with the description of Stevens and Hall (*Ann. Mycol.*, vii, p. 49, 1909), and the appearance of the disease on pecan is entirely similar except as regards the foliage, the hyphae on which are small and inconspicuous. Affected pecan leaflets are shed after a period of suspension by the rhizomorphs. Mycelial wefts resembling those formed on citrus develop on the lower leaf surface on this host.

On pomegranate twigs the sclerotia are small, irregular, and crustose. The entire lower leaf surface is covered with an exceptionally dense, tawny, fungous membrane.

The thread blight fungus was isolated from basidiospores on grapefruit, pear, pecan, and *Aleurites*. No differences were observed in cultures on various media or in the spore characters from the above-mentioned hosts. The pathogenicity of the fungus was proved by cross-inoculation experiments on pear and grapefruit with pure cultures from these hosts and *Aleurites*. In addition, positive results were given by inoculations on grapefruit and pear with the organism from pecan and pomegranate.

The fungus enters the tissues through the stomata and passes between the cells, involving all the tissues. The host cells of mature lesions are collapsed, and the protoplasts are shrunken and

stain more deeply. The rind tissues of diseased grapefruits are affected similarly to those of the leaves.

The causal organism of this thread blight is identified by the authors as *Corticium koleroga* [*R.A.M.*, iii, p. 391], with which *C. stevensii* [ibid., vi, p. 125] is regarded as synonymous, the following also being synonyms: *Pellicularia koleroga*, *Erysiphe scandens*, *Hypochnopsis ochroleuca*, and *Hypochnus ochroleucus*.

All available evidence indicates that the organism hibernates by means of the sclerotia, infection being locally disseminated by the basidiospores. High temperatures and intense humidity have been found to be essential to the development and spread of thread blight. Under Florida conditions satisfactory control of the disease on grapefruit may be obtained by one application of 3–3–50 Bordeaux mixture plus 1 per cent. oil emulsion at the beginning of the rains.

BUTLER (L. F.). **Increasing prevalence of Hypochnus rot of Apples.**—*Phytopath.*, xvii, 10, pp. 743–744, 1927.

For the past two years an apple rot agreeing in essentials with that described under the name of *Hypochnus* rot by Eustace from New York (*N.Y.* (*Geneva*) *Agric. Exper. Stat. Bull.* 235, 1903) has been observed on Baldwins at many of the eastern markets. A fungus with the characteristics of a *Hypochnus* has lately been isolated from Winesap, Ben Davis, Roxbury Russett, and Jonathan apples from widely separated localities.

On Winesaps and Jonathans the lesions closely resemble those caused by north-western anthracnose [*Neofabraea malicorticis*], frequently showing a conspicuous tan centre with a brown to black border. The necrotic tissue, however, is somewhat tough and stringy in contrast to the soft consistency of the true anthracnose or bull's eye rot lesions. On Winesaps the rot does not appear until rather late in the storage season, and has not been found following scab [*Venturia inaequalis*] as in the case of the Baldwin, Ben Davis, and Rhode Island Greening varieties. Under moist conditions the mycelium spreads over the surface of the fruit, radiating uniformly from the lesions and forming a characteristic fine, closely appressed, white mycelial mat. The hyphae are always provided with clamp-connexions.

Apple trees and 'hairy root' investigation.—*Fruit World of Australasia*, xxviii, 9, p. 423, 1927.

At a conference of the plant pathologists of all States of the Commonwealth held at Melbourne on 20th September, 1927, the Victorian Minister for Agriculture referred to the rejection by the Queensland Government of Victorian fruit tree stocks, owing to the supposed presence of crown gall [*Bacterium tumefaciens*] or hairy root, and stated that Victorian pathologists were convinced that hairy root was merely the result of a normal development of fibrous roots natural to the Northern Spy Stock. The delegates passed a resolution that there is no evidence that crown gall is a serious disease in Australian apple orchards.

It was also resolved that plant pathologists should interchange information upon new diseases occurring in their respective States,

and that a census should be prepared showing the distribution and severity of plant diseases throughout the Commonwealth.

MAURIZIO (ANNA MARIA). **Zur Biologie und Systematik der Pomaceen bewohnenden Podosphaeren. Mit Berücksichtigung der Frage der Empfänglichkeit der Pomaceenpropfbastarde für parasitische Pilze.** [On the biology and systematic position of the Podosphaereae inhabiting the Pomaceae, with reference to the question of the susceptibility of pomaceous graft hybrids to parasitic fungi.]—*Centralbl. für Bakt.*, Ab. 2, lxxii, 1–7, pp. 129–148, 6 graphs, 1927.

The writer's investigations, carried out at the Botanical Institute of Berne University during 1925 and 1926, have shown that, of the three morphologically more or less distinct sub-species [' Kleine Arten '] of *Podosphaera oxyacanthae*, namely *P. oxyacanthae* (sensu strictu), *P. aucupariae*, and *P. amelanchieris*, the first-named may again be sub-divided into two biologic forms, f. sp. *crataegi* and f. sp. *cydoniae* [*R.A.M.*, v, p. 747]. The average length of the conidia of *P. aucupariae* was found to be 21 to 22 μ, while those of *P. oxyacanthae* (s. str.) measured 24 to 27 μ. The former has from 2 to 5 appendages on the perithecia, the latter 5 to 12, and *P. amelanchieris* 9 to 15. The diameter of the perithecia on the different hosts forms a series from 64·15 μ (average) on *Sorbus* [*Pyrus*] *aucuparia* to 81·82 μ on *Amelanchier*, but the three subspecies differ in the peak of the curve obtained by plotting the numbers of each diameter. Pear is the collective host for the two biologic forms of *P. oxyacanthae* (s. str.) and also, as Škorić's investigations have shown [ibid., vi, p. 124], for *P. leucotricha*. Comparative measurements indicate that the *Oidium* commonly found attacking apple leaves is probably the conidial stage of *P. leucotricha* rather than *P. oxyacanthae*.

The results of inoculation experiments with *P. oxyacanthae* f. sp. *crataegi* on the graft hybrids *Crataegomespilus asnieresii* and *C. dardari* showed that the former was immune and the latter only very slightly susceptible. Both pear and the graft hybrid *Pirocydonia winkleri* were susceptible to *P. oxyacanthae* f. sp. *cydoniae*, while *P. danieli* proved moderately resistant. It is also mentioned that *P. danieli* and pear both showed abundant infection by *Gymnosporangium sabinae*, while *P. winkleri* was resistant. These data and those obtained by previous investigators form the basis of a brief discussion on the various theories concerning the transmission of hereditary characters in grafting.

THOMAS (H. E.). **Kieffer Pear seedlings and fire blight resistance.**—*Bull. Torrey Bot. Club*, liv, 7, pp. 583–585, 1927.

During the seasons of 1924, 1925, and 1926, 774 seedlings of Kieffer pear, a hybrid between the highly resistant oriental pear (*Pyrus serotina* var. *culta*) and the susceptible European species (*P. communis* var. *sativa*, presumably the cultivated form Bartlett), showing a moderate degree of resistance to fireblight (*Erwinia amylovora*) [*Bacillus amylovorus*: *R.A.M.*, v, p. 107], were inoculated at least five times with this organism. In August, 1924, 177 of the trees were blighted, and by October, 1926, 368 of the 679

remaining were more or less affected. This method of eliminating the susceptible individuals at an early age obviates the necessity of bringing the entire original population to maturity. No striking parallel was apparent between resistance to blight and any of the external characters studied, though there was a certain correlation between resistance and a reddish colour of the bark (characteristic of the susceptible parent, the European pear). The spiny character of the latter was found quite as often in the resistant as in the susceptible class. These data [presented in tabular form] are taken to support the expectation that resistant individuals of this population may show the desirable characters of the Bartlett pear.

DECKENBACH (K. N.). Грушевая ржавчина—**Gymnosporangium sabinae (Dicks.) Winter** и способы борьбы с ней в условиях Крыма. [Pear rust—*Gymnosporangium sabinae* (Dicks.) Winter, and its control under conditions existing in the Crimea.]—*Материалы по Микологии и Фитопатологии.* [*Materials for Mycol. and Phytopath.*], Leningrad, vi, 1, pp. 68–91, 1927.

One of the most dangerous diseases of pears in the Crimea, frequently entirely destroying the whole crop in certain districts, is stated to be the rust caused by *Gymnosporangium sabinae.* The disease occurs over the whole peninsula, but the greatest damage is always noted in proximity to junipers. These are common everywhere, and one species in particular, *Juniperus excelsa*, is considered to be almost impossible to eradicate, as it is to be met with in all the local woods, invariably bearing numerous fructifications of the fungus without any appreciable harm to itself. This fact renders the problem of controlling pear rust very arduous, and the scope of the investigation described in this paper (made during the period from 1921 to 1924 at the South Crimean Plant Protection Station) was to find the best way of checking the alarming spread of the disease by some other means than the elimination of the alternate hosts.

Pear trees were conclusively shown to be re-infected each spring by the teleutospores produced on junipers and not, as suggested by some authors [*R.A.M.*, iv, p. 711], by overwintering mycelium on the trees. The experiments to prove this point consisted in selecting pear trees that had been heavily rusted during the previous season and that still bore some dead leaves with aecidia, and covering them in early spring with gauze to protect them from outside infection. Every one of these trees produced entirely healthy foliage and remained healthy during the whole vegetative period, while unprotected controls close by were heavily rusted. A considerable reduction of infection was also attained by setting up live or artificial wind-screens close to the pear trees. Biological observations of the fungus on junipers showed that the fructifications mature on this host in the Crimea usually towards the beginning of April, but not before the air temperature has reached a minimum of 10° C.; and there is an interval of some days between their appearance and the development of their sporidia. This is the critical moment when the pears should be treated, either by isolation as described above, or by spraying with fungicides. Among

the fungicides tested, very good results were obtained with a 1 in 40 solution of lime-sulphur. Spraying should be repeated after every rain for about one month.

[RICE (W. H.) & MAKGILL (R. H.).]. **Control of brown-rot in stone fruits. Experiments with Peach trees at Henderson, 1926–27 season.**—*New Zealand Journ. of Agric.*, xxxv, 4, pp. 236–238, 1927.

During 1926–7, experiments on the control of the brown rot fungus (*Sclerotinia cinerea*) [*S. fructicola* or *S. americana*: *R.A.M.*, vi, p. 619; vii, p. 32] on peaches were resumed at Henderson, New Zealand [ibid., vi, p. 105], where the loss of fruit in neighbouring orchards from the summer (or ripe rot) form of the disease is from 25 to 40 per cent. according to the amount and kind of spray used. The trees were given a dormant spraying with 5–4–50 Bordeaux mixture when the buds commenced to break, followed a day later by a 1 in 17 oil spray. The Paragon variety, owing to its susceptibility to leaf curl [*Taphrina deformans*], received 8–6–40 Bordeaux mixture. When the trees were in leaf they were sprayed with the following forms of atomized sulphur: sulpho (a dry powder form), atomic sulphur, and dry-mix sulphur. The last-named consists of ½ oz. caustic soda dissolved in ¼ pint water and added to ½ lb. casein in one gall. water. Then 16 lb. fine, powdered sulphur is creamed by adding the dissolved casein and more water if necessary, and 5 lb. fresh rock-lime is carefully slaked, diluted to 10 galls., the creamed sulphur added while stirring, and the whole made up with water to 100 galls.

Except in the case of the Paragon trees, which remained free from infection, none of the sprays gave satisfactory control of the spring forms of brown rot, viz., bud rot, blossom rot, and twig rot. The degree of infection is considered to depend largely upon varietal susceptibility. Summer fruit rot was fairly well controlled by sulpho and atomic sulphur (10 lb. to 100 galls. of water in each case), but the best control was obtained with the dry-mix sulphur spray (5 per cent. summer fruit rot, as compared with 8 per cent. in control trees not sprayed after 18th October), the trees so treated showing notably good growth and foliage.

VASSILIEVSKY (N. I.). К вопросу о взаимоотношении видов **Septoria** на **Ribes grossularia** и **R. nigrum**. [On the question of the relationship between species of *Septoria* on *Ribes grossularia* and *R. nigrum.*]—*Morbi Plantarum*, Leningrad, xvi, 1, pp. 61–70, 1927. [German summary.]

The author states that a careful examination of Sydow's and Jaap's exsiccata to which Diedicke referred in his diagnoses of *Septoria sibirica* Thuem. on the gooseberry and of *S. ribis* Desm. on black currants respectively, as well as his own observations on the two diseases on these hosts in Russia [*R.A.M.*, v, p. 41], showed that the morphological differences between the two fungi are much less marked than noted by Diedicke, transitional forms existing in all the material examined by him. Moreover, the black fruiting bodies present on both sides of the leaves in Sydow's exsiccata were found to be for the most part not pycnidia but sclerotia typical of

Mycosphaerella grossulariae. Cross-inoculations made in 1925 and 1926 also showed that the fungus from gooseberries may infect black currants, and vice versa, the latter being much more susceptible to infection with both organisms than the former, an observation which is further confirmed by the incidence of the disease on both hosts in nature. Finally, both species produced the same perithecial stage, indistinguishable either morphologically or biologically. For this reason he considers that both species are identical. In his opinion, the ascogenous form should be correctly named, as suggested by Klebahn, *Mycosphaerella ribis* Fuck. instead of *M. grossulariae* (Fr.).

In regard to *Septoria grossulariae*, the author considers this species as doubtful, since an examination of Libert's exsiccata in the Herbarium of the Chief Botanic Garden in Leningrad showed that this fungus is morphologically identical with *S. ribis*.

In conclusion, it is pointed out that in Russia *S. ribis* was found also to attack the berries both of black currants and of gooseberries, causing their premature fall.

WARDLAW (C. W.). **Note on the occurrence of Pythium proliferum, De Bary, on the roots of the Strawberry.**—*Ann. of Botany*, xl, 164, pp. 817–818, 1927.

This is a further account of the Lanarkshire strawberry disease [*R.A.M.*, vi, p. 673], one of the organisms associated with which has now been identified as *Pythium proliferum*, which is regarded as a facultative parasite able to attack roots that are weakened by unfavourable soil conditions.

BROOKS (A. N.). **Anthracnose of Strawberry (Colletotrichum sp.) reported again from Florida.**—*Plant Disease Reporter*, xi, 11, p. 133, 1926. [Mimeographed.]

Anthracnose of strawberries (*Colletotrichum* sp.), first observed in Florida in the autumn of 1926 on runners set during or after July, was again reported over a limited area in 1927. Young plants are often killed before they can set root. The disease is more severe on low, wet ground than in higher and drier situations.

MAGEE (C. J. P.). **Investigation on the bunchy top disease of Banana.**—*Australia Council Sci. & Indus. Res. Bull.* 30, 64 pp., 21 pl., 1 map, 1927.

Most of the information contained in this comprehensive account of the bunchy top disease of bananas has already been summarized [*R.A.M.*, vi, pp. 173, 174 *et passim*], but the following new points are of interest. Mr. J. Campbell, Mycologist to the Fiji Department of Agriculture, has recently reported the occurrence of the disease in the Ellice Islands, where it was introduced some years ago with infected suckers from Fiji. The only commercial variety grown in north-eastern New South Wales and southern Queensland is the highly susceptible dwarf Cavendish (*Musa cavendishii*). Some ten other native and foreign banana varieties [which are enumerated] have also been found susceptible. Careful investigations of the disease in various parts of the world have failed to show that any species or variety of banana is immune from, or

highly resistant to, bunchy top. Attempts to transmit the disease to maize, and *Canna* sp., which showed symptoms very suggestive of bunchy top, gave negative results.

DEMAREE (J. B.) & COLE (J. R.). **Two unreported leaf spots of Pecan.**—*Plant Disease Reporter*, xi, 11, pp. 135–136, 1927. [Mimeographed.]

Considerable damage has been caused during 1927 in southern Georgia, southern Alabama, and northern Florida by two hitherto unreported fungous leaf spots of pecan [*Carya pecan*].

Leaf blotch is characterized by the appearance, on the upper surface, of small brown spots surrounded by pale yellow, later reddish to dark brown, circular areas, and expanding to a diameter of $\frac{1}{2}$ to $\frac{3}{4}$ inch. On the under side of the leaf are olive-green, velvety spots formed by the conidiophores and conidia of the causal organism. Later these give rise to pycnidium-like bodies which impart a blotched appearance to the leaf. Eventually the numerous lesions on each leaflet coalesce and kill the entire leaf. The fungus, which usually appears in July and causes partial or total defoliation of the trees about a month later, is believed to be a species of *Cercospora* associated with *Mycosphaerella convexula* Schweinitz. A species of *Botrytis*, possibly parasitic on the leaf blotch fungus, frequently gives the foliage a mildewed appearance. Both orchard and nursery trees are attacked, the latter suffering more severely, and most varieties of pecan seem to be susceptible. In southern Georgia hickory [*Hicoria*] is also attacked.

Downy spot, which has been observed only within a limited area of southern Georgia, develops in the form of indefinite, pale, later light brown to black, spots, measuring up to $\frac{1}{4}$ inch in diameter, on the under side of the leaflets. The white appearance is due to the production of curved, hyaline conidia, issuing from minute acervuli. Dew or light rains seem to spread the conidia, thus forming a thin, white layer over or near the spot. The Delmas, Moneymaker, and Frotscher varieties appear to be particularly susceptible to downy spot, which occurs both in nurseries and orchards and may cause some defoliation in severe cases. The causal organism is provisionally considered to be identical with *Cylindrosporium caryigenum* Ell. & Ever., found on *C. amara* (*H. minima*) at London, Canada, in 1889. Further studies on the morphology and life-history of the fungus are in progress.

LEE (H. A.) & MARTIN (J. P.). **More effective dust fungicides by the use of oxidizing agents with sulfur.**—*Indus. & Engin. Chem.*, xx, 1, pp. 23–28, 6 graphs, 1928.

Young's investigations having shown the fungicidal effect of sulphur to be due to the formation of pentathionic acid by oxidation in the presence of air [*R.A.M.*, ii, p. 462], experiments were conducted to determine the possibility of increasing the natural oxidation of the sulphur in the air by the addition of oxidizing agents. A preliminary account of these has already been published [ibid., vii, p. 105]. Sulphur dusts were prepared, one containing 0·25 per cent. nitric acid and another 1 per cent. potassium permanganate. Other new dusts tested were beta-naphthol, 5 per

cent. in a lime carrier and also in a sulphur carrier (to ascertain whether the acid or alkaline reaction of the carrier affects the toxicity of the active fungicidal agent). A collodial sulphur was also tried. Thirteen applications of the dusts were given over a period of 22 weeks.

Eye spot of sugar-cane (*Helminthosporium sacchari*) was immensely increased by the use of beta-naphthol in lime. Similar results have been obtained in many tests where lime was used as a carrier, presumably as a result of the saponification of some of the materials of the host cuticle, thus facilitating the penetration of the leaf by the fungus. In the plots treated with sulphur plus 1 per cent. potassium permanganate the amount of infection was 89·9 per cent. less than in the untreated control. Nitric acid was also fairly effective in increasing the toxicity of the sulphur.

In another test ordinary sulphur alone gave only an 8 per cent. reduction of infection compared with the untreated controls, while sulphur plus 1 per cent. potassium permanganate diminished the incidence of eye spot by 20 per cent. In the plots treated with chloramine T in lime a 24 per cent. reduction of the disease was obtained in comparison with the controls. On the other hand, chloramine T in a sulphur carrier gave no control, indicating that possibly an alkaline carrier is essential for this material. Neither beta-naphthol in lime nor beta-naphthol in sulphur proved effective in this experiment.

The results of a further test indicated that 5 per cent. potassium permanganate was very effective in increasing the toxicity of the sulphur but no further increase was obtained with 10 per cent.

It is, of course, necessary to protect sulphur containing oxidizing agents from a source of ignition. At the time of writing more than 30 tons of sulphur plus 1 per cent. potassium permanganate are stated to have been applied without inconvenience.

Patkaniane (Mlle A. R.). О фунгицидных свойствах соды. [On the fungicidal properties of soda.]—*Материалы по Микологии и Фитопатологии* [*Materials for Mycol. and Phytopath.*], Leningrad, vi, 1, pp. 193–203, 1927.

The experiments described in this paper consisted in testing under laboratory conditions the germination of spores of *Nectria ribis*, *Leptosphaeria periclymeni* Oud. var. *tatarica*, *Rhabdospora lonicerae*, *Tubercularia vulgaris* [*N. cinnabarina*], *Cucurbitaria caraganae*, *Rhizopus nigricans*, *Penicillium glaucum*, *Rhytisma salicinum*, and *Melampsora salicis* in concentrations varying from 0·00001E to 0·4E of the normal equivalent solution of dehydrated soda (53 gm. soda to 1 l. water), with or without the addition of nutrients (meat juice plus sugar) [cf. *R.A.M.*, vii, p. 41]. All the fungi tested, whether saprophytes or parasites, reacted in approximately the same measure to the increase in the concentration of soda. In pure solutions all ceased to germinate at the concentration of 0·1 E, with the exception of *R. lonicerae* and *T. vulgaris*, the germination of which was inhibited at concentrations of 0·01 E and above. When nutrients were added to the solutions, the fungi showed a greater resistance to the action of the soda, since their germinability only ceased at a concentration of 0·2 E, with the exception of *R. nigricans*

which ceased to germinate at 0·02 E. It was also noted that the loss of viability, as the concentration was increased, was much more gradual in solutions with nutrients than in pure solutions.

The results of these experiments lead the author to conclude that soda possesses well-defined fungicidal properties, since all the fungi tested perished sooner or later, the conidial forms being the least resistant. It is pointed out, however, that the spores of some of the fungi exhibited such a high degree of resistance, as to indicate that in practice chemicals of a much greater fungicidal value should be used for their control.

González Fragoso (R.). **Botánica criptogámica agrícola.** [Agricultural cryptogamic botany.]—Biblioteca agrícola española, Ser. V, 321 pp., 6 col. pl., 122 figs., Espasa-Calpe, S.A., Madrid, 1927.

This useful compendium of agricultural cryptogamic botany forms part of the series of phytopathological treatises in the Spanish Agricultural Encyclopedia. The scope of the work comprises, in addition to some general introductory observations, sections on the diseases caused by fungi; the taxonomy and classification of the fungi; and vascular cryptogams. The book is clearly arranged, each genus of fungi being represented by one or more well-known species which are concisely described. A glossary of technical terms is appended.

Rivers (T. M.). **Filterable viruses. A critical review.**—*Journ. of Bact.*, xiv, 4, pp. 217–257, 1 pl., 1927.

In this paper, read before the Society of American Bacteriologists on the 29th December, 1926, the author discusses the epidemiology, immunity, filterability, size, and cultivation of the viruses; effect of the viruses upon cells; inclusion bodies; resistance to chemical and physical agents; questions relating to the corpuscular nature, respiration, mutation, and living state of the viruses; malignant growths; and the future study of virus diseases. A list of the diseases placed in the filterable virus groups by different workers is given in tabular form, and a bibliography of 410 titles is appended.

Hoggan (Ismé A.). **Cytological studies on virus diseases of solanaceous plants.**—*Journ. Agric. Res.*, xxxv, 7, pp. 651–671, 5 pl., 1 fig., 1927.

Experiments in which a wide range of solanaceous plants were inoculated with one or more of the 11 different virus diseases distinguished by Johnson [*R.A.M.*, vi, p. 501] showed that when ordinary tobacco mosaic was inoculated into tobacco, two types of cell inclusions, X bodies and striate material [ibid., vi, pp. 261, 431], were invariably found in the chlorotic areas of mottled leaves, but never in the dark green parts or in healthy plants. They were usually abundant and occurred in all parts of the leaf lamina, except the vascular bundles. Inoculation with this mosaic also caused the development of both types of cell inclusions in the following plants: chilli, tomato, *Physalis pubescens*, *P. franchetti*, *Petunia violacea*, *Hyoscyamus niger*, *Nicandra physaloides*, *Solanum miniatum*, and *S. atropurpureum*, and they were also found

in potato and some other species of *Solanum* and *Physalis*. In chilli, where only a general chlorosis of the leaves was produced, without distinct mottling, the striate material was abundant throughout the tissues but X bodies were present only in the cells adjacent to the veins. In all the hosts, the inclusions closely resembled those occurring in tobacco. *Physalis alkekengi*, reported by Nishimura as a symptomless carrier (*Bull. Torrey Bot. Club*, xlv, pp. 219–233, 1918), developed mottling after inoculation with tobacco mosaic and contained both inclusions.

Tobacco plants inoculated with a combination of the viruses of tobacco and cucumber mosaic, or of the former and each of six others, also developed both types of inclusions.

In contrast with tobacco mosaic, no inclusions were found in cucumber mosaic or when this mosaic was inoculated into ten of the above-named hosts, although mottling was frequently produced. Inclusions were also not found, in spite of most careful search, in speckled tobacco, mild tobacco, bleaching, and petunia mosaics, spot necrosis, ring spot, and tomato stem necrosis.

Of 9 hosts inoculated with yellow tobacco mosaic, 4 contained inclusions of both types and 4 striate material only; while of 5 hosts with medium tobacco mosaic, 1 showed both types of inclusions and 3 striate material only. In petunia, yellow tobacco mosaic sometimes produced enormous, vacuolate, very coarsely granular bodies, but on the other hosts the inclusions closely resembled the ordinary ones.

Yellow and medium tobacco mosaics are considered to be closely related to ordinary tobacco mosaic, while the other results indicate that there are several distinct viruses causing diseases of solanaceous plants.

In mottled leaves of potatoes affected with crinkle, rugose, Montana crinkle, leaf rolling, mild, or 'supermild' mosaics, many of the cells of the chlorotic areas contained a vacuolate, protoplasm-like material, especially noticeable in the palisade and spongy mesophyll cells. Leaves showing very recent symptoms contained only irregular masses of this material, which became more definite in shape as the disease progressed, until they resembled the amoeba-like bodies described by Smith [ibid., iii, p. 538].

This material is not regarded as a degeneration product of the nucleus, but it may represent some modification of the host cytoplasm.

In association with all the virus diseases of potato studied, except calico, leaf roll, and streak, irregular brownish masses were found in stained material, but no striate material was noted.

On inoculation of ordinary tobacco mosaic virus into potato, X bodies and striate material appeared abundantly in the cells. Frequently, a single cell contained a tobacco X body, striate material, and the vacuolate substance.

The X bodies are not considered to be organisms.

Brown (W.) & Harvey (C. C.). **Studies in the physiology of parasitism. X. On the entrance of parasitic fungi into the host plant.**—*Ann. of Botany*, xl, 164, pp. 643–662, 1 diag., 1927.

The authors' experiments [the technique of which is fully de-

scribed] showed that membranes of paraffin wax, previously demonstrated to be impermeable to one of the simplest electrolytes (sodium hydroxide), were readily penetrated by the germ-tubes of *Botrytis cinerea*, provided sufficient nutrient was available in the drop in which the spores were sown to allow of good germination [*R.A.M.*, i, p. 238]. Penetration in this case could not have been determined by any chemotropic influence acting across the membrane. Membranes of formalized gelatine, which are highly permeable to crystalloidal substances, were penetrated by the fungal hyphae independently of the original distribution of the nutrient material. *B. cinerea* also readily penetrated both the inner and outer surfaces of membranes consisting of the epidermis of *Allium* scales and of the leaves of *Eucharis mastersi* and *E. amazonica*, which had been thoroughly washed to remove any possible chemotropic substances occurring in the cells.

Experiments with a series of membranes of formalized gelatine of graded hardness, obtained by differential imbibition by placing the gelatine strips in a series of alcohol-water mixtures (0, 20, 40, 60, &c., per cent. alcohol) and then adding formalin, showed that different fungi possess varying intrinsic powers of penetration, *B. cinerea* being able to penetrate the 40 to 50 per cent. alcohol membranes, *Penicillium glaucum* those of 30 to 40 per cent., and *Rhizopus nigricans* those of 20 to 30 per cent. No sign of a dissolving action on the membranes was observed and penetrating power was not increased with time. The germ-tubes of *B. cinerea* were found to be unable to penetrate the epidermis devoid of stomata of *Eucharis* spp. and several other plants as long as the underlying leaf tissue was turgid. When the turgor was removed by plasmolysis or the underlying cells were killed by any other method, penetration occurred readily.

Discussing the question of the stimulus leading to penetration, the writers consider that the data presented in this paper clearly point to contact tropism. Penetration was shown to occur in circumstances excluding any possible chemotropic factor. The experiments on *Eucharis* leaves are further regarded as giving strong support to the mechanical theory of penetration. They show that the total resistance of the cuticle to penetration is partly a function of the cuticle itself and partly due to the turgor of the cells supporting the epidermis. The possible existence of a cutin-dissolving enzyme obtains no support from the authors' experiments, all the facts observed being better interpreted on a mechanical basis. According to the views advanced in this paper, chemical substances issuing from the host plant into the infection drop have no directive effect on the fungal hyphae, but they are not therefore to be considered as of no importance to the fungus. Such substances may act in the same way as a purely environmental factor, affecting the germination and growth of the organism.

McLean (F. T.). **Feeding plants manganese through the stomata.** —*Science*, N.S., lxvi, 1716, pp. 487–489, 1927.

In order to ascertain whether the beneficial effect of manganese on chlorotic spinach plants [*R.A.M.*, vi, p. 284] is due to its action on the soil or to its influence on the plant, some affected plants were

supplied with manganese through the soil while others received it directly through the leaf stomata. The apparatus used in the latter process was an adaptation of the porometer similar to that employed in the author's and Lee's inoculations of citrus leaves with the canker organism [*Pseudomonas citri*: ibid., ii, p. 62].

In one series of tests, manganese was injected in the leaves of the chlorotic spinach plants in pots in a solution of 5 or 50 parts per mille, while in another series 150 c.c. of a solution containing 50 p.p.m. of manganese was poured on the soil. A fortnight after treatment the plants receiving 50 p.p.m. of manganese were found to be greener than the controls and also than those given only 5 p.p.m. The average weight of the control plants on harvesting a week later was 5.1 gm., compared with 6·6 gm. for the treated ones, the average increase from the manganese being 30 per cent. and the difference between the two strengths not being significant. Manganese applied to the soil was apparently about equally effective. It is concluded that lime-induced chlorosis can be cured by the action of the manganese within the body of the plant, though the changes effected in the soil by additions of the mineral may also be beneficial.

KLOTZ (L. J.). **Inhibition of enzymatic action as a possible factor in the resistance of plants to disease.**—*Science*, N.S., lxvi, 1721, pp. 631–632, 1927.

The results of experiments [technical details of which are given] have shown that the trunk bark of sour orange (*Citrus aurantium*) and tangelo (a hybrid of pomelo and tangerine) inhibits the hydrolytic action of the diastase and invertase found in the mycelium of *Pythiacystis* [*Phytophthora*] *citrophthora* [*R.A.M.*, ii, p. 539] and *Phomopsis californica* [ibid., ii, p. 66] to a much greater extent than does that of the lemon (*C. limonia*). It is suggested that the resistance of the sour orange and the susceptibility of the lemon to the diseases caused by the above-mentioned organisms may be due to the influence of the plant tissues on the fungal enzymes.

KÖCK [G.]. **Die 'Viruskrankheiten' der Kartoffelpflanze.** [The virus diseases of the Potato plant.]—*Oesterr. Zeitschr. für Kartoffelbau, 1927*, 2, pp. 1–3, 1927.

This is a brief, popular account of the principal virus diseases of the potato, namely, leaf roll, mosaic, streak, curl, and the so-called 'bouquet' disease [*R.A.M.*, iv, p. 149], which is found chiefly on luxuriantly growing varieties and occupies an intermediate position between leaf roll and curl. It is pointed out that, under Austrian conditions, the most susceptible varieties are not always the most seriously damaged. Thus 'Industrie' is highly susceptible to mosaic, but the consequences of infection are less injurious on this variety than on others showing greater resistance but succumbing more rapidly when once attacked.

BLODGETT (F. M.). **Tobacco mosaic on Potatoes.**—*Phytopath.*, xvii, 10, pp. 727–734, 1927.

The discrepancies in Fernow's and Johnson's accounts of the symptoms produced by the transmission of mosaic from tobacco

to potato [*R.A.M.*, v, pp. 119, 314] are explained by the fact that the former used Green Mountain potatoes and the latter Bliss Triumph. Inoculation with tobacco mosaic produced only local necrotic lesions in Bliss Triumph, with no systemic infection, while on the Green Mountain variety the symptoms closely resembled those of streak [ibid., iii, p. 548]. The streaking of the stems and veins and necrotic spotting of the leaves are usually accompanied in the second generation by extreme dwarfing and dropping of leaves. This suggests that certain features of the disease diagnosed as streak in potatoes may be due to a form of infection by tobacco mosaic. No. 9 potatoes exhibited, besides a limited amount of necrotic streaking and spotting, a mottling resembling that associated with mosaic on tobacco rather than the usual type occurring on potato. The plants of this variety were also slightly stunted.

Preliminary experiments on other potato varieties indicate that the tobacco mosaic virus causes a wide range of symptoms which were pronounced only at relatively high temperatures (26° C. and above). No symptoms could be detected in young plants at temperatures from 15° to 18°.

The tobacco mosaic virus is readily transmissible from potatoes back to tobacco, on which it appears as a combination disease consisting of tobacco mosaic and the virus disease commonly carried by apparently healthy commercial potatoes.

The needle puncture method, making fairly numerous punctures, was found to be effective for the inoculation of the tobacco mosaic virus into potatoes.

Köck (G.). **Ueber Knollenkrankheiten der Kartoffel.** [On tuber diseases of the Potato.]—*Oesterr. Zeitschr. für Kartoffelbau, 1927*, 3, pp. 1-6, 1927.

The writer describes in popular terms the symptoms of the diseases affecting potato tubers in Austria, namely, brown rot (*Phytophthora*) [*infestans*], *Fusarium* or white rot [*F. coeruleum*], bacterial rot, scab (*Actinomyces*) [*scabies*], corky scab (*Spongospora solani*) [*S. subterranea*], wart disease [*Synchytrium endobioticum*], hitherto observed only in a restricted area of Vorarlberg and in one locality of Styria, scurf [*Corticium solani*], ring rots associated with bacteria and species of *Fusarium* and *Verticillium*, sprain, and various types of malformation consequent on unfavourable weather conditions during growth. Very brief general indications are given for the prevention of these diseases.

Weiss (F.), Lauritzen (J. I.), & Brierley (P.). **Investigation of Potato storage rots in 1925–26 at the Marble Laboratory Inc., Canton, Pa.**—*Proc. Thirteenth Ann. Meeting Potato Assoc. of America, December 28–29, 1926*, pp. 108–112, 1927.

After a brief account of the importance of *Fusarium* spp. in the causation of potato tuber rots, and of the mode of infection of these parasites, the writers describe their investigations at the Marble Laboratory, Canton, Pennsylvania, on wound infection of the tubers. The work constitutes an accessory to that of Goss [*R.A.M.*,

ii, p. 521] on the species of *Fusarium* concerned in storage rots in the western States.

Of the species hitherto investigated, *F. coeruleum* and a strain of *F. discolor* (both widely distributed in northern potato areas) have proved to be the most virulent, the former being capable of initiating tuber rot at temperatures down to at least 39° F., while the latter can attack the tissues and cause a progressive rot at 32°. *F. trichothecioides*, a western species included for comparative purposes, can cause decay at and probably below 44°.

Generally speaking, bruises were found to heal more slowly than cuts and abrasions and were correspondingly more susceptible to *Fusarium* infection. On the other hand, *Phytophthora* [*infestans*] readily infects cuts and abrasions but cannot easily penetrate a bruised area. The rate of healing of injuries is largely influenced by temperature and is very slow in cool storage. Thus a skinned tuber kept at 40° and 80 per cent. humidity is still susceptible to certain kinds of *Fusarium* infection three days after injury. Tubers should be thoroughly dried before storage and placed in slatted crates or suitably piled bags, instead of in large bins. Healing after injury was observed to be particularly slow in Russet and White Rural, while Cobbler healed very rapidly, and Green Mountain, Spaulding Rose, and Triumph were intermediate.

Four stages which have a bearing on the susceptibility of wounds to infection were recognized, viz., (1) the fresh wound, injured cells exposed and bathed in exuded sap; (2) drying of the injured surface, with a deposit of starch and salts, and death of the peripheral cells; (3) the infiltration of the peripheral cell walls with suberin substances; and (4) the formation of scar tissue (cork) beneath the injured area. It was found that wounds in the first three stages are all susceptible to infection by vigorous wound parasites at 44° with humidities of 70 per cent. and upwards, irrespective of ventilation between still air and four changes per hour. None of the species of *Fusarium* employed in these studies requires a saturated atmosphere to cause infection, at least at temperatures of from 40° to 60°; in fact, one species appears to penetrate more readily and deeply at low humidity (70 or even 50 per cent. of saturation) than at high.

RACICOT (H. N.). **Does black-leg overwinter in apparently healthy Potato tubers?**—*Proc. Thirteenth Ann. Meeting Potato Assoc. of America, December 28–29, 1926*, pp. 72–74, 1927.

The results of three years' experiments in Matane County, Quebec, showed that the incidence of blackleg [*Bacillus atrosepticus*] in Carman No. 3 potato tubers was reduced by about two-thirds by seed treatment with formalin or corrosive sublimate. A study of the progeny of diseased plants indicated that 20 to 25 per cent. of apparently healthy tubers produced infected plants in the following season. Soil infection and insect transmission were excluded by the conditions of the tests, and it seems evident that blackleg overwinters in the apparently healthy tubers produced by diseased plants, which should, therefore, be thoroughly rogued to prevent the perpetuation of infection.

MARTIN (W. H.). **Potato scab control with organic mercury compounds.**—*Proc. Thirteenth Ann. Meeting Potato Assoc. of America, December 28–29, 1926*, pp. 74–81, 1 graph, 1927.

The results of three years' work on the control of potato scab [*Actinomyces scabies*] by organic mercury compounds in New Jersey are stated to be very promising. The standard treatment was 1½ hours' immersion in 1 in 1,000 mercuric chloride, while the organic mercury compounds were semesan bel dust [Du Pont] (2 oz. before or 3 oz. after cutting the tubers), semesan bel dip (1 lb. in 5 qts. before and after cutting), Bayer dip (1 lb. in 10 qts. before cutting and 1 lb. in 20 qts. after cutting). All these preparations gave approximately equal control of scab, the dips being slightly more effective than the dusts. The treatment of the cut surfaces leads to an unsightly black discoloration, and the disinfectants should therefore be applied before cutting.

SHEPHERD (E. F. S.). **Expériences sur le contrôle du 'Potato blight'.** [Experiments in the control of Potato blight.]—*Rev. Agric. de l'Île Maurice, 1927*, 32, pp. 65–66, 1927.

A brief account is given of experiments in the control of potato blight [*Phytophthora infestans*] conducted at Réduit and Bambous, Mauritius, in 1926. Eight applications of Burgundy mixture 4–5–40 were given at average intervals of nine days between July and September at Réduit. The total cost of the treatment was Rs. 24·50 [about £1 16*s.* 9*d.*] while the profit derived from the operations was estimated at Rs. 64·80 [£4 17*s.* 2*d.*]. At Bambous, where four applications of Burgundy mixture were given between 19th August and 27th September, the cost of the treatment was Rs. 13·55 and the estimated profit Rs. 41·52. It is concluded that spraying is a lucrative operation in Mauritius during the damp season, when the damage caused by potato blight, especially at high altitudes, is severe.

RAYLLO (A. I.). Опыты искусственного заражения грибком **Hypochnus solani Prill. et Delacroix.** [Artificial infection experiments with the fungus *Hypochnus solani* Prill. and Delacroix.]—*Материалы по Микологии и Фитопатологии* [*Materials for Mycol. and Phytopath.*], Leningrad, vi, 1, pp. 166–179, 4 graphs, 1927.

This is the full paper on the author's experiments in the artificial infection of the potato and other plants with *Hypochnus* [*Corticium*] *solani*, an abstract of which has already been noticed from another source [*R.A.M.*, vi, p. 747].

WHITE (R. P.). **The efficiency of organic mercury compounds for the control of Rhizoctonia on Potato.**—*Proc. Thirteenth Ann. Meeting Potato Assoc. of America, December 28–29, 1926*, pp. 81–97, 1927.

This paper is a summary of the results obtained during 1926 in co-operative experiments on the control of *Rhizoctonia* of potatoes [*Corticium solani*] in British Columbia, Quebec, Florida, Idaho, Nebraska, Oregon, Maine, and Kansas. The experimental methods are concisely outlined and the data presented in tabular form.

The percentage of clean sprouts in the various plots was determined in Oregon, Maine, Florida, and Kansas. The data from Florida indicated that the percentage of stem lesions was very low and no evident control was obtained with any treatment. In Maine evident control (reduction of stem lesions from 29·3 to under 10 per cent.) was obtained with hot or cold corrosive sublimate (1 in 120 and 1 in 1,000, respectively), semesan bel dip, DDD 12 bel dip, DDD 37 bel dip or dust (Du Pont), and Bayer Special No. 90. The Du Pont instantaneous dips were used at a strength of 10 per cent. and the Bayer product at 5 per cent. Comparable results were obtained in Oregon with the semesan bel and DDD 37 bel dips and corrosive sublimate, and in Kansas with semesan dust (2 or 3 oz. per bushel) which, as well as the semesan bel compounds, gave significant increases of yield (at least 20 per cent.). No general correlation, however, could be established between an increased yield and a high percentage of clean sprouts.

Data from British Columbia indicate that DDD 37 bel dip compared very favourably with corrosive sublimate in the reduction of sclerotial formation on the tubers. Good results were obtained in Quebec with DDD No. 15 dust and hot or acidulated corrosive sublimate. In Oregon and Maine the semesan bel and DDD compounds, used as dips, gave very satisfactory results, but none of the organic mercury treatments was as effective in Nebraska as the standard corrosive sublimate. The dip treatments were in all cases more effective than the dusts where both were tested.

Dobrozrakova (Mme T. L.). **Непаразитные заболевания Картофеля.** [Non-parasitic diseases of the Potato.]—*Morbi Plantarum*, Leningrad, xvi, 2, pp. 121–135, 1927. [French summary.]

The author points out the drawbacks presented in the study of non-parasitic diseases of the potato by the lack of agreement existing among various workers in the classification of such diseases, and even in the terminology used, such as, for instance, the different definitions of primary infection given by Quanjer [*R.A.M.*, iii, p. 415] on one side, and by Edgerton and Jaczewski [ibid., vi, p. 572] on the other. The work reported in this paper was carried out from 1924 to the end of 1926 at the Phytopathological Station of the Agricultural Institute in Leningrad with a view, firstly, to study the symptomology in the field of mosaic, aucuba mosaic, leaf roll, crinkle (frisolée), dwarfing (? curly dwarf), and various necroses of the vascular bundles and parenchymatous tissues of potatoes; and secondly, to investigate, under experimental conditions, the intertransmissibility of the diseases among different varieties of potatoes, the effect of cultural and external conditions on the symptoms, and the transmissibility of the diseases to plants belonging to other species and genera of the Solanaceae.

The results indicated that the fundamental type of each of the diseases studied [a description of which is given] is stable and does not vary in response to the variety of the host or to external conditions. It was, however, found that temperatures below 15° and above 22° C. tended to mask the intensity of the symptoms and to modify some of the secondary characters. Adequate manuring and

wide spacing also tended to reduce the severity of the attacks, but the progeny of tubers infected with a particular disease always reproduced it, sometimes with a cumulative effect.

Infection experiments showed that potato varieties previously considered to be more or less immune, e.g., Imperator, were easily infected by grafting a piece from a diseased tuber on to healthy tubers, thus showing the need of considerable care in the selection of varieties deemed resistant. The work is still being prosecuted.

WERNER (H. O.). **The hollow heart situation in the Russet Rural Potato.**—*Proc. Thirteenth Ann. Meeting Potato Assoc. of America, December 28–29, 1926*, pp. 45–51, 1927.

The results of statistical studies, conducted in 1926 on 5,196 Russet Rural potato tubers grown on irrigated land at the Scotts Bluff County Experimental Farm, western Nebraska, showed that hollow heart tubers [*R.A.M.*, vi, p. 688] constituted 8·42 per cent. by number and 15·78 per cent. by weight of those weighing over 75 gm. The prevalence of hollow heart increased with the size of the tubers produced and it was much more frequent in spindle tubers than in normal ones. The disease was found to be correlated with a small number of stems to the plant, three-stem plants producing the most hollow heart tubers. Usually only one hollow heart tuber was produced per plant, but a few plants developed as many as four. The hollow heart areas occurred most frequently towards the apical end of the tuber. Growth cracking occurred in 35 per cent. of the diseased tubers, compared with 2·6 per cent. of the sound ones. Appreciable control of hollow heart was secured by planting large seed-pieces, especially whole tubers, while sufficient improvement was obtained by treatment with thio-urea and sodium sulphocyanate to warrant further experiments.

PEACOCK (W. M.) & WRIGHT (R. C.). **Low temperature injury to Potatoes when stored shortly after harvest.**—*Proc. Thirteenth Ann. Meeting Potato Assoc. of America, December 28–29, 1926*, pp. 99–101, 1927.

Definite injury has been found to occur in a number of commercial varieties of potatoes stored at low temperatures (32°, 36°, and to a slight extent at 40° F.). One type of damage is marked by a shrivelling or shrinking of the tubers, accompanied by a general breakdown of the tissue, while the other is characterized by darkening or killing of the tissues surrounding the buds and lenticels. The former type is found chiefly among immature potatoes stored at 32° within four or five days after harvesting. The condition becomes noticeable two or three weeks after the tubers are placed in storage; on removal to a temperature of 70° decay ensues, and in the Early Rose variety the symptoms are identical with those of black heart [*R.A.M.*, v, p. 626]. The second type of injury has been observed in both immature and mature potatoes from one to three weeks after being placed in storage at 32° or 36°. It was accompanied by a failure of germination, the production of spindle sprouts, and a pitting and browning of the lenticels in most varieties. Preliminary storage for 21 days at 40° or 50°, or for 7 day

or longer at 60° or 70°, greatly reduced the incidence of these injuries.

White (R. P.). **Induced dormancy in seed Potatoes due to seed treatment.**—*Proc. Thirteenth Ann. Meeting Potato Assoc. of America, December 28–29, 1926*, pp. 97–99, 1927.

For five successive seasons the writer has observed a condition in treated seed potatoes which he terms 'induced dormancy'. The treatments generally recommended for the control of seed-borne diseases kill the tips of the young central sprouts, while the development of the lateral buds replacing these is retarded. This effect has been found to be particularly noticeable on tubers immersed in hot formaldehyde or corrosive sublimate for lengthy periods. Climatic conditions during the growing season largely determine the extent of the damage caused by induced dormancy, the effects of which are lessened by warm weather after planting, and also by suitable fertilization. Cold storage potatoes are generally less liable to suffer than those kept under ordinary conditions. In seasons unfavourable for the crop, induced dormancy may become a serious factor in decreasing the yield.

Martin (W. H.). **Report of Seed Certification Committee, 1926.**—*Proc. Thirteenth Ann. Meeting Potato Assoc. of America, December 28–29, 1926*, pp. 141–154, 1927.

Numerous changes have been made of recent years in the standards of seed potato certification in the United States. In 1922 only two virus diseases, mosaic and leaf roll, were included in the lists, to which curly dwarf, spindle tuber, yellow dwarf, giant hill, and witches' broom have since been added. In 1922 the limit of tolerance for mosaic at the first inspection was 5 per cent. in six, and 10 per cent. in nine States, whereas at present only one State permits 10 per cent., four 5 per cent., eight 3 per cent., and two only 2 per cent. Details are given concerning the organization of the work of certification in various States, together with some observations on protection against fraud and on the training of inspectors. In conclusion, a set of uniform standards for adoption by all States is submitted for consideration.

Fernow (K. H.). **Benefits derived by New York State growers from the Florida seed source test.**—*Proc. Thirteenth Ann. Meeting Potato Assoc. of America, December 28–29, 1926*, pp. 15–18, 1927.

For two years tests have been carried out in Florida with a view to determining, before planting time, which stocks of New York seed potatoes are suitable to be grown for certified seed. The method of selection is based exclusively on freedom from virus diseases. Samples of 200 or more tubers are sent to Florida about the middle of November, planted about 1st February, and inspected about 1st April, the results of the examination being communicated to the seed growers as early as possible. In spite of certain discrepancies in the comparative results [presented in tabular form] of the trials in Florida and at Ithaca (New York), where the certification work is conducted, the method as a whole has proved

extremely valuable. The cost of the work for two years was less than $500.

ABE (T.). **Experimentelle Studien über die Pilzschäden von Reissämlingen. III.** [Experimental studies on the fungous injuries of Rice seedlings. III.]—*Journ. Plant. Protect.*, xiv, 10 pp., 1 pl., 1927. (Japanese.) [Abs. in *Japanese Journ. of Botany*, iii, 4, p. (77), 1927.]

Inoculation experiments with *Achlya prolifera* on rice seedlings grown on nutrient media free from fungi, and in soil, gave positive results. The growth of the plants was arrested without any conspicuous symptoms of infection, an effect attributed by the writer to the excretion of toxic substances by the fungus. The hydrogen-ion concentration of the substrata fluctuated between P_H 6·8 and 8·4 during the experiments, and this was shown by special tests to exercise no adverse effects on the seedlings.

HEMMI (T.) & YOKOGI (K.). **Studies on Sclerotium diseases of the Rice plant. I.**—*Agric. & Hort.*, ii, 9–10, pp. 955–1094, 1 pl., 1927. [Japanese, with English summary.]

This paper deals chiefly with the effect of thermal variations on mycelial growth and sclerotial formation in *Hypochnus* [*Corticium*] *sasakii*, *H. centrifugus* [*C. centrifugum*], *Sclerotium oryzae-sativae* [*R.A.M.*, vii, p. 54], and another species of *Sclerotium*, parasitic on rice plants. These organisms generally made slight growth at about 40° C. and little or none at 0°. The maximum temperature for mycelial development in all four fungi was 40° to 42°. *C. sasakii* and *C. centrifugum* grew best at 30°, *S. oryzae-sativae* at 32°, and the undetermined species of *Sclerotium* at 28°. It was observed that the growth limits of all the fungi were narrower on apricot decoction agar than on the other media used.

ENDO (S.). **Ueber die Sklerotienkrankheit der Reispflanzen in den Philippinen.** [On the *Sclerotium* disease of Rice plants in the Philippines.]—*Journ. Plant Protect.*, xiv, 6 pp., 1927. (Japanese.) [Abs. in *Japanese Journ. of Botany*, iii, 4, p. (77), 1927.]

The work of M. A. Palo on the *Rhizoctonia* disease of rice in the Philippines [*R.A.M.*, vi, p. 371] is discussed, and the conclusion reached that the causal organism is identical with *Hypochnus* [*Corticium*] *sasakii* occurring in Japan [see preceding abstract].

NAKATOMI (S.). **On the variability and inheritance of the resistance of the Rice plants against the Rice blast disease.**—*Japanese Journ. of Genetics*, iv, pp. 31–38, 1927. (Japanese.) [Abs. in *Japanese Journ. of Botany*, iii, 4, pp. (101)-(102), 1927.]

The results of investigations, carried out during 1913–14, on the comparative susceptibility to rice blast [*Piricularia oryzae*] of a number of native and foreign strains, showed that the highest degree of resistance occurred in the varieties from India, Java, and the Philippines. The disease was observed to be much less prevalent in 1913 than in 1912 or 1914, a fact attributed by the author

o the dry spell immediately after infection. This hypothesis was onfirmed by the results of an experiment in which many more esions were found on plants kept at a humidity of 94 than on hose kept at 78·4. The common experience that nitrogenous nanure favours the development of rice blast was verified by these tudies. The factors conferring resistance to the disease were shown o be inherited according to Mendel's law.

IATSUURA (I.). **Comparative studies on four Hyphomycetes pathogenic to Rice seedlings.**—*Journ. Microbiol. Soc.*, xxi, pp. 1551–1572, 1927. (Japanese.) [Abs. in *Japanese Journ. of Botany*, iii, 4, p. (93), 1927.]

Cultural studies were made of three species of *Brachysporium* nd one of *Helminthosporium* which are more or less injurious to he germination and growth of rice seedlings in Japan [*R.A.M.*, vii, p. 54, 55]. The distinguishing characteristics of the various pecies were best observed in media containing asparagin and in oy-bean extract agar. The optimum temperature seemed to vary omewhat for each of the four fungi; the maximum appears to be onsiderably above 32° and the minimum rather below 10° C.

Weir (J. R.).] **Some general principles in Rubber pathology.**—*Malayan Tin & Rubber Journ.*, xvi, 20, pp. 1232–1236, 1927.

In a lecture delivered at the Sungkai Club on 12th October, 1927, Dr. J. R. Weir, Head of the Pathological Division of the Rubber Research Institute, Malaya, outlined some general principles of ubber pathology. The aspects of cultivation considered in the aper comprised a definition of avoidable loss factors, e.g., those ssociated with fungous diseases and brown bast; the development f resistant strains; estate sanitation; the diagnosis of disease and ts practical application; and the relative importance of pathoogical factors, including the character of the injury, the aggressiveess of the agency causing loss, and the environmental factors romoting attack.

REYDON (G. A.). **Over den meeldauw in Oost-Java. Resultaten van de in 1927 gehouden meeldauwenquête.** [On the mildew in East Java. Results of the mildew inquiry held in 1927.]—*Arch. voor Rubbercult. Nederl.-Indië*, xi, 10, pp. 435–464, 4 graphs, 1927. [English summary.]

The results of an inquiry made in 1927 concerning the prevalence f mildew [*Oidium heveae*: *R.A.M.*, vi, p. 689] on the rubber estates of East Java showed that on 70 out of 105 plantations the incidence f infection increased considerably during 1925 and 1926. About 95 per cent. of the total number of estates in East Java are affected, while in West Java less than half the plantations have reported the lisease. On 48 per cent. of the affected estates in East Java the lisease was severe, usually spreading over large areas. The seednd budding-beds of 17 per cent. of the estates were reported to how infection, but these reports are thought to be largely due to onfusion with the attacks of the yellow mite (*Tarsonemus transucens*), which causes similar symptoms to those of mildew. Dieack of the branches and a decrease in yield were ascribed to

mildew by 37·6 and 6·4 per cent., respectively, of the estate-owners. In the district under the observation of the Malang Experiment Station the trees wintering late in the east monsoon (July) are more severely attacked than those wintering early (April). The rainfall on the mildew estates during the east monsoon was lower on the average than that on the unaffected plantations. Infection was found to be more severe on low-lying estates than on those at higher altitudes, while the trees on the southern hill slopes were more liable to the disease than those facing east.

[This paper is summarized in *Planters' Chron.*, xxii, 53, pp. 821–823, 1927.]

PAINE (F. S.). **Studies of the fungous flora of virgin soils.**—*Mycologia*, xix, 5, pp. 248–266, 3 pl., 1927.

This paper describes investigations upon the number and identity of the fungi inhabiting virgin soil (Clinton silt loam in untilled open pasture, and timber land) near Iowa City, and the depth to which they are found. The isolations were made during early autumn, when, owing to heavy rain, the soils were at saturation point. Samples were taken twice from each kind of land at depths of 1, 3, 6, and 12 in., and once from the surface of the woodland.

Thirty-one species of fungi [which are described and figured] were identified, including five new species. four of which were found at from 6 to 12 in. below the surface. Five species each of *Mucor* (less abundant in open pasture than forest) and *Hormodendron* were found, eight of *Aspergillus* (*A. fumigatus* occurring in large numbers in open pasture lands), and seven of *Penicillium*. Only three species were common to woodland and open pasture.

Many of the species grew on a synthetic medium with cellulose as the only source of carbon. Four of the species of *Aspergillus*, five of *Penicillium*, three of *Hormodendron*, and several unidentified species of *Alternaria* were able to ferment cellulose. The Mucoraceae were not able to grow on this medium.

Fungi became increasingly rare at depths more than 3 in. below the surface.

SAMOUTZEVITCH (M. M.). **К вопросу о почвенной грибной флоре.** [On the question of the soil-inhabiting fungal flora.]—*Материалы по Микологии и Фитопатологии* [*Materials for Mycol. and Phytopath.*], Leningrad, vi, 1, pp. 204–213, 5 figs., 1927.

In giving a cursory review of the literature on soil-inhabiting fungi [the more recent of which has been noticed in this *Review*], the author points out that, so far as he is aware, he is the first to have investigated this question in Russia. His researches, conducted for several years chiefly in the region of Leningrad and made at different seasons of the year, have elicited that, taken as a whole, the soil-inhabiting fungal flora in that region is very much the same as noted by other workers abroad. Most common was *Rhizopus nigricans*, followed by an undetermined species of *Fusarium*, *Mucor plumbeus*, *M. racemosus*, *Alternaria* spp., etc. It included, however, some other fungi which have not been recorded in soils elsewhere, e. g., *Diplocladium macrosporium*, *Diplosporium album*, and also two new species named by the author *Mucor ramo-*

issimus and *Verticillium vinosum.* Brief descriptions and figures are given of these species.

The soil under forests was found to be richer in various species of fungi than that taken from vegetable gardens in or immediately around Leningrad, the former having yielded 35 species as against 23 in the latter. It was also observed that in the autumn the fungal population of the soil was much more numerous than at other seasons. No great differences were noted in the composition of the fungal flora at varying depths up to 25 to 30 cm., below which all the fungi disappeared; in the upper layers Mucoraceae appeared to predominate almost everywhere.

MEYER-BAHLBURG (W.). **Die Bekämpfung der 'Weissseuche' (Urbarmachungskrankheit) des Hafers.** [The control of the 'white disease' (reclamation disease) of Oats.]—*Deutsche Landw. Presse,* liv, 44, pp. 610–611, 4 figs., 1927.

In north-west Germany the so-called 'reclamation' disease of oats, rye, beans, and potatoes [*R.A.M.*, vi, p. 350] occurs principally on soils consisting of dry peat and greyish-white soft sand, thousands of hectares being affected. The condition has been recognized for upwards of fifty years under the name of 'white disease', a term which the writer prefers to reclamation disease as being more descriptive.

The exceptionally high acidity of the above-mentioned types of soil necessitates abundant applications of lime, which are considered to be directly responsible for the development of the disease. The actual causal organism of the white disease, probably a soil bacterium [but see next abstract], has not yet been determined, but its predominance in the soil is evidently correlated with the neutralization of the peat by liming. The organism appears to require a moderately high soil temperature for its development, oats generally reaching the age of four to six (or even eight) weeks before contracting the disease, while winter rye is not attacked until the spring. It is also evidently strictly aerobic, hence the copper sulphate used for its control must be strewn on the surface and not incorporated in the soil. Excellent results have been obtained in one locality of north Germany by the application of finely crystallized copper sulphate, at the rate of about 2 to 2·12 cwt. per hect., to a field previously fertilized with ammonium superphosphate (approximately 8 cwt. per hect.).

SMITH (W. S.). **An investigation of the occurrence and causes of the phenomena designated by the term 'Urbarmachungskrankheit'.**—Dissertation, 149 pp., 20 pl., Veenman & Sons, Wageningen, Holland, 1927. [German summary. Abs. in *Chem. Abstracts*, xxi, 21 (Part 1), pp. 3647–3648, 1927.]

Investigations were carried out on the nature and causes of the pathological condition in plants designated by the term 'Urbarmachungskrankheit' [reclamation disease: see preceding abstract]. Pot experiments were conducted with oats and peas on eleven 'sick' soils, the symptoms in which were generally in agreement.

Frost and bacteria were eliminated as causes, and the usual sterilization of the soil had no effect. The popular notion that the condition is associated with a certain type of black moor ('gliede') was confirmed, an admixture of this material with normal sandy soil producing the usual symptoms. By extraction of the 'gliede' with hot alcohol, two types of organic substances were isolated, one fraction precipitating on cooling the alcohol and one remaining in solution. From the latter a crystalline substance was isolated which is fairly volatile at 100°; this is termed 'gliedine'. A few milligrams of this substance applied to soil growing healthy oat or pea plants caused the development of the typical symptoms, while in very low concentrations it exercised a stimulating effect. The symptoms of grey speck of oats [ibid., vi, p. 578] were induced by the fraction precipitated on cooling of the alcohol.

The effect was studied on various sick soils of applications of sand, $CaCO_3$, compost, stable manure, $CuSO_4$, $MnSO_4$, $KMnO_4$, $ZnSO_4$, $MgSO_4$, and $FeSO_4$. Only compost and copper sulphate were effective, the latter producing the best results when applied at 50 to 100 kg. per hect. The beneficial effects of these substances persisted during the second year.

Since an organic substance slowly distilling at 100° was apparently involved, sick soils were heated for three hours on three different days in a steam sterilizer. A slightly sick soil was completely restored, a moderately sick one recovered almost entirely, and in a very sick soil the appearance of the symptoms was delayed. Sterilized, as well as ashed and ignited, compost was equally efficacious with the untreated material in checking the disease; hence the effect cannot be ascribed to bacteria but must be due to inorganic constituents. The titration curves of sick soils did not differ from those of normal ones. Evidence is submitted that the favourable effect of $CuSO_4$ is due to the formation of an insoluble compound of copper and the organic substance, gliedine, which causes the reclamation disease.

Bakhtin (V.). Об ооспорах у **Peronospora hyoscyami De Bary.** [Note on the oospores of *Peronospora hyoscyami* De Bary.]—Reprinted from *Материалы по Микологии и Фитопатологии.* [*Materials for Mycol. and Phytopath.*], v, 2, 3 pp., 5 figs., 1926. [Received February, 1928.]

The author states that in the summer of 1913, in the government of Samara [central Russia], he found a plant of *Hyoscyamus niger* bearing lesions typical of *Peronospora hyoscyami*, and in the leaves of which the previously unknown oogonia and oospores were present. On the grounds of the structure of these organs [a description of which is given, together with a Latin diagnosis], he considers that this fungus should be referred to the section *Leiotheca* Schröter, subsection *Effusa* De Bary. The oogonia are globose or subglobose, 45 to 60 μ in diameter, with a thin, non-persistent wall. The antheridia are single, club-shaped, and 30 to 35 by 16 to 20 μ. The oospores are round to angular, yellowish-brown, 30 to 44 μ in diameter, and provided with an irregularly folded perineum from 5 to 7 μ thick.

BOKMA DE BOER (B.). **De bibitbehandeling en bibitvoorziening ten behoeve der aanplantingen van Suiker-ondernemingen.** [The treatment and supply of setts for the planting of Sugar estates.]—*Arch. Suikerind. Nederl.-Indië*, II Deel, xxxv, 43, pp. 1083–1094; 44, pp. 1113–1123, 1927.

Recent investigations in connexion with sereh disease of sugar-cane and its treatment by the hot water method [*R.A.M.*, vi, p. 438] are reviewed and discussed in connexion with the writer's belief that the varieties now grown are steadily degenerating in Java. The general adoption of this treatment is advocated and its practical advantages are explained at some length. An editorial note states that there are no grounds for the view that production is declining in Java.

Pahala blight studies in Hawaii.—*Facts about Sugar*, xxii, 44, pp. 1064–1065, 1927.

According to recent information supplied by W. T. McGeorge, of the Hawaiian Sugar Planters' Association, excellent results in the control of Pahala blight of sugar-cane [*R.A.M.*, v, p. 518] have been obtained by the application of sulphur to the soil, to which both the susceptible Yellow Caledonia and the comparatively resistant D 1135 varieties responded beyond all expectation. The effect of this treatment is to increase the acidity of the soil, and therewith the availability of the acid-reacting salts, primarily iron. The principal difference between the soils of blighted and healthy fields is in the lower hydrogen-ion concentration of the sub-soil compared with the top soil of the former. The greater ash and chlorine content of blighted plants appears to be related to the development of chlorosis. The causative factor of blight may be carried on the cuttings, but it rapidly disappears in good soil. Cuttings from blighted plants, however, should not be used as setts on account of their reduced vitality.

LEE (H. A.), BARNUM (C. C.), WELLER (D. M.), & CARPENTER (C. W.). **Progress report of the Pythium root rot phase of the Lahaina growth failure problem.**—*Planter and Sugar Manufacturer*, lxxix, 18, pp. 345–347, 1 diag., 1927.

During 1926–7, the form of growth failure of sugar-cane, formerly known as Lahaina disease [*R.A.M.*, vi, p. 187], that is associated with a species of *Pythium*, was severe in Lahaina, H 146, and H 20–S–20 canes in Hawaii; H 109, Yellow Caledonia, D 1135, the Tip canes, and P.O.J. 2714, 2725, and 2727 proved very resistant. That the disease is seasonal and periodic is suggested by the fact that Uba cane, newly introduced into Hawaii from Porto Rico, where it is immune from *Pythium* infection, was attacked, but recovered.

A correlation was observed between the attacks of the *Pythium* on roots of Lahaina cane and a neutral or alkaline reaction of the soil. An experiment [which is described], in which twenty plots of Lahaina cane at the Waipio sub-station were treated with various fertilizers, showed that potash and phosphoric acid had no marked effect on the root rot. Certain plots also received sulphur

applications, and in these the soil, during the first months of the ratoon crop, showed an increased acidity, but there was no visible effect on the *Pythium* infection. In this experiment it was also noted that the best stools of Lahaina cane occurred on well-drained areas, drainage and soil aeration being clearly correlated with resistance to the disease. Soils with a high concentration of sodium and magnesium and a correspondingly low ratio of calcium are characterized by impermeability to water and defective aeration, and greatly favour the development of the fungus. That chemical control may also prove possible was indicated by an experiment in which applications of copper sulphate solution, one part in 50,000, to 12 in. pot cultures of Lahaina cane artificially infected with the *Pythium*, gave marked increases in aerial and root growth.

SARTORIS (G. B.). **A cytological study of Ceratostomella adiposum (Butl.) comb. nov., the black-rot fungus of Sugar-cane.**—*Journ. Agric. Res.*, xxxv, 7, pp. 577–585, 4 pl., 1927.

Studies made with pure cultures of *Sphaeronema adiposum*, which was found severely attacking seed pieces of P.O.J. 213 and 36 sugar-canes near Houma, Louisiana, showed that the so-called pycnidia are really perithecia of a *Ceratostomella*. The author transfers it to this genus as *C. adiposum*.

The development of the perithecium is described in considerable detail. It contains biseriate, 8-spored asci, which are cylindrical to pyriform and measure 20 to 25 by 10 to 12 μ. The ascus wall degenerates at an early stage, leaving the ascospores embedded in groups in a translucent fatty substance, in which they may continue development. When mature they measure 6·5 to 8 by 3·5 to 4 μ and are crescent shaped. The hydrostatic pressure developed by the fatty substance forces the ascospores up the beak, at the mouth of which they gather in a translucent drop, held in place by the fimbriate appendages. The drop yellows with age and finally turns brown. The fatty substance aids dissemination of the spores by sticking them to visiting insects, and it is also thought to keep the spores from drying up. The ascospores are said to remain viable for about three months.

BONDARTZEVA-MONTEVERDE (Mme V. N.). Новые виды и формы описанные в Отделе Фитопатологии за **25** лет его деятельности. [New species and forms described in the Phytopathological Section during the 25 years of its existence.]—*Morbi Plantarum*, Leningrad, xvi, 1, pp. 34–42, 1 pl., 1927.

This is a list of 132 new species and forms of fungi [arranged in alphabetical order of the generic names], for the most part parasitic, which were discovered and described by the staff and collaborators of the Phytopathological Section of the Chief Botanic Garden in Leningrad during the twenty-five years of its existence. In separate lists are also given eight species of fungi which have been examined and renamed in the Section, and four plant-inhabiting bacteria. The plate contains figures of five of the new species of fungi, which could not be published at the time when the papers in which they were described were printed.

SAWADA (K.). **Descriptive catalogue of the Formosan fungi. Part III.**—*Rept. Dept. Agric. Res. Inst. Formosa*, 27, 73 pp., 4 pl., 1927. [Japanese.]

The Formosan species of *Pythium*, *Phytophthora*, *Cystopus*, *Peronospora*, and some allied genera are described and all (with one exception) are figured. The following new species are described in Japanese: *Albugo* [*Cystopus*] *ipomoeae-hardwickii* on *Ipomoea hardwickii*, *Phytophthora boehmeriae* on *Boehmeria nivea*, *P. citricola* on *Citrus*, *P. cyperi-rotundati* on *Cyperus rotundatus*, *P. tabaci* on *Nicotiana tabacum*, *Peronospora bothriospermi* on *Bothriospermum tenellum*, and *P. euphorbiae-thymifoliae* on *Euphorbia thymifolia*.

SAWADA (K.). **Erysiphaceous genera in Formosa, considered in their conidial generation.**—*Rept. Dept. Agric. Res. Inst. Formosa*, 24, 55 pp., 3 pl., 1927. (Japanese). [Abs. in *Japanese Journ. of Botany*, iii, 4, p. (108), 1927.]

In this paper several species of *Erysiphe* found in Formosa are classified according to their conidial dimensions and characters [cf. *R.A.M.*, vi, p. 511]. The genus is divided into three groups, namely, (1) that with conidiophores of uniform thickness produced on the upper side of the mycelium and perpendicular to the surface of the host; (2) with conidiophores as in (1) but swollen at the base; and (3) with conidiophores produced laterally on the mycelium and curved at the base so as to become perpendicular to the host's surface. The Formosan species belonging to these three groups are described in detail and illustrated.

DECKENBACH (K. N.) & KORENEFF (M. S.). **Материалы для изучения мучнистой росы специальных культур Крыма.** [Contribution to the study of the mildew fungi of plantation crops in Crimea.] —*Morbi Plantarum*, Leningrad, xvi, 2, pp. 155–160, 1927. [German summary.]

With reference to the senior author's previous paper [*R.A.M.*, v, p. 70] on the mildews of Cucurbitaceae and tobacco in the Crimea, it is stated that in September, 1925, melons were found in a garden bearing perithecia of *Erysiphe cichoracearum* and of *Sphaerotheca* [*humuli* var.] *fuliginea*; one leaf, in particular, bore the fructifications of the former on its upper side, and those of the latter on the lower side. The two species may be distinguished on the leaves with a hand lens in strong light, the perithecia of *S. fuliginea* appearing as dark, spherical bodies of approximately the same size, superficially seated on the mycelium, while those of *E. cichoracearum* appear to be covered by the mycelium and vary greatly in size. At the same time perithecia of *E. cichoracearum* were also found on mildewed leaves of watermelons [*Citrullus vulgaris*], this being, as far as the authors are aware, its first record on this host.

In regard to tobacco mildew (*Oidium tabaci*) [? *E. cichoracearum*] further observations appeared to confirm the presumption already stated [loc. cit.] that it may overwinter on Cucurbitaceae, but all attempts to find its perithecia have so far proved abortive. Preliminary experiments indicate the possibility of controlling tobacco

mildew with a 1 in 40 solution of a decoction of tobacco in lime-sulphur at 32° Baumé. It is pointed out, however, that the effect of this treatment on the curing qualities of the tobacco has not been ascertained.

KERN (F. D.) & CHARDON (C. E.). **Notes on some rusts of Colombia.**—*Mycologia*, xix, 5, pp. 268–276, 1927.

The Colombia rust fungi listed and annotated in this paper were collected during April to June, 1926, and comprise 33 species in 9 genera, of which 3 genera and 15 species are not included in Mayor's list ('Contribution à l'étude des Urédinées de Colombie', *Mém. Soc. Neuch. Sci. Nat.*, v, pp. 442–599, 1913) and 4 are new to South America.

KARAKULIN (B. P.). К характеристике рода **Gloeosporium.** [Contribution to the characterization of the genus *Gloeosporium.*] —*Morbi Plantarum*, Leningrad, xvi, 1, pp. 54–60, 1 fig., 1927.

The chief purpose of this paper is to draw attention to the long-felt need of a monographic study of the genus *Gloeosporium*, which covers a vast number of imperfect fungi, frequently differing widely from one another. In reviewing the history of the genus since its creation in 1849 by Desmazières and Montagne, the author discusses in some detail v. Höhnel's attempt in 1916 to break it up into four genera, namely, *Gloeosporina*, *Cylindrosporella*, *Monostichella*, and *Gloeosporidium*, a suggestion which he does not accept in its entirety in view of the lack of constancy and definiteness in the morphological characters of these genera. Neither does he accept other genera suggested by various authors, such as *Gloeosporidiella* created in 1921 by Petrak for *Gloeosporium ribis* on the ground of the simultaneous formation in the latter of macro- and microconidia, as he agrees with the view that microconidia are but degenerate conidia which chiefly appear towards the end of the vegetative period of the host, or are formed in cultures.

A brief review of the morphological and biological characters of a number of species now included in the genus, and of the relationship which has been established between some of them and ascigerous forms belonging to the genera *Glomerella*, *Gnomonia*, and *Pseudopeziza*, leads him, however, to consider that several distinct sections may be outlined, although there is still a lack of sufficient material to arrive at definite conclusions in this respect. In his opinion, it is too early to discard the genus *Gloeosporium* as, in spite of its clumsiness, it has gained widespread recognition among leading mycologists, and no entirely satisfactory subdivision has, as yet, been proposed.

SMEE (C.). **First report on pests and diseases of Tea in Nyasaland.**—*Nyasaland Dept. of Agric. Bull.* 1, Entom. Ser., 4 pp., 1927. (Reprinted from *Ann. Rept. Dept. of Agric. Nyasaland*, pp. 14–17, 1927.)

Many of the common leaf diseases of tea have been found in Nyasaland, but they are considered unlikely to cause much damage except possibly in new gardens, which should be sprayed with Bordeaux mixture as a precautionary measure. Brown blight (*Colleto-*

trichum) [*Glomerella cingulata*] and grey blight (*Pestalozzia*) [*theae*] are most prevalent on new extensions of Indian tea, particularly where very heavy cover crops are used. A very common fungus of the *Phoma* type was found in conjunction with the mosquito bug [*Helopeltis theivora*]. Various other leaf disorders, apparently of physiological origin, were observed, especially a leaf scab of slow development and apparently slight importance.

Apart from root diseases, the most serious damage to tea in Nyasaland is caused by a disease associated with *Macrophoma theae*, which is responsible for a die-back of the shoots of older bushes and for severe injury to young plants, especially of the unacclimatized Indian varieties. In July, 1926, the affected bushes were pruned and given several applications of Bordeaux mixture, with successful results in most cases. The incidence of this disease could probably be reduced by stricter attention to soil conditions and by a clearance of the vegetation surrounding the nurseries in order to admit a freer circulation of air. Later in the year the same fungus was found on *Grevillea* trees.

A few older bushes have been destroyed by *Armillaria* [*mellea*] and some young Indian plants succumbed to a disease apparently identical with brown root rot [*Fomes lamaoensis*].

By far the most important and complicated disorder of Nyasaland tea is the root disease due to *Botryodiplodia* [*theobromae*: *R.A.M.*, ii, p. 343], which was found attacking 66 per cent. of the diseased plants of all ages collected in the Mlanje and other districts in December, 1926. The disease occurs in exactly the same form as that described from Ceylon and must be controlled by similar measures, the most important of which is the burning of prunings for the first two or three years in newly established gardens. *M. theae* is frequently found causing a die-back of new shoots on bushes weakened by the gradual development of *B. theobromae*. Such bushes should be treated with lime, the dead shoots being excised to a depth of three to four inches into the green, healthy wood.

TUNSTALL (A. C.). **Vegetable parasites of the Tea plant. The blights.**—*Quart. Journ. Indian Tea Assoc., 1927*, 3, pp. 73–86, 1927.

In this paper, the first of a series dealing with the vegetable parasites of the tea plant, the author gives popular descriptions of the symptoms and life-history of the following blights occurring on the leaves: grey blight (*Pestalozzia theae*), brown blight (*Glomerella cingulata*), and rim blight (associated with *Alternaria*, *Cladosporium*, and other fungi). Notes are given on the history of these diseases and the damage which they cause, together with directions for their control.

TUNSTALL (A. C.). **Some observations on violet root rot. (Sphaerostilbe repens, B. and Br.).**—*Quart. Journ. Indian Tea Assoc., 1927*, 2, pp. 69–71, 1927.

A brief, popular description is given of the symptoms and life-history of violet root rot of tea bushes (*Sphaerostilbe repens*), which is stated to be of very frequent occurrence in the tea gardens of

north-east India, as well as in the surrounding jungle [*R.A.M.*, iii, p. 4]. The fungus is generally found on sickly bushes, though occasionally vigorous individuals are also attacked. The chief condition favouring the spread of the disease is defective aeration of the soil, the reaction of which is of less importance. This should be remedied by attention to drainage and cultivation. The application to the soil of organic matter and rapidly acting manures; the removal of dead and unhealthy bushes; and the restriction of plucking are also recommended.

CLINTON (G. P.) & ANDERSON (P. J.). **Tobacco diseases observed in 1926.**—*Connecticut Agric. Exper. Stat., Tobacco Stat. Bull.* 8, pp. 55 T–57 T, 3 pl., 1927.

Brief notes are given on the following diseases of tobacco observed in Connecticut during 1926 [cf. *R.A.M.*, vi, p. 381]. Wildfire [*Bacterium tabacum*] was very destructive in the Housatonic Valley, but seed-bed infection in the Connecticut Valley was lighter than in any year since the disease first began to spread. Very little damage was caused by angular leaf spot [*Bact. angulatum*]. Various leaf spots, e.g., marbling, white ring, and white speck, apparently due to mechanical or chemical causes, were moderately prevalent. Other diseases noticed were *Fusarium* spot (*F. affine*), bed rot, black root rot [*Thielavia basicola*], brown root rot [loc. cit.], sore shin [*Corticium solani, Pythium de Baryanum*, etc.], curly dwarf, and calico [mosaic].

CORBETT (G.). **Les maladies sur le Tabac rencontrées à Maurice en 1926 avec des notes sur les moyens de s'en preserver.** [Tobacco diseases observed in Mauritius during 1926, with notes on control measures.]—*Rev. Agric. de l'Île Maurice, 1927*, 32, pp. 65–68, 1927.

A brief, popular account is given of the writer's recent observations on tobacco diseases in Mauritius. The most severe damage appears to be caused by mosaic, which often occurs to the extent of 90 or 100 per cent. on the new shoots developing after the plants are cut down close to the ground [*R.A.M.*, v, p. 254]. Affected plants should be burnt before the new shoots have time to grow in order to prevent the spread of infection. The author believes that there are two distinct types of tobacco mosaic in Mauritius, one associated with chlorosis and deformity of the leaves, and the other without chlorosis, seldom causing deformity, but leading to the production of thick, hard leaves.

Granville wilt (*Bacterium solanacearum*) [ibid., vii, pp. 121–123] may be controlled by crop rotation.

Hollow stalk [*Bacillus carotovorus*: ibid., vi, p. 381] was shown by inoculation experiments to be very easily transmissible from one plant to another, and diseased individuals should therefore be eradicated and destroyed immediately.

BEETS (A. N. J.). **Verslag der proeven omtrent den invloed van het aanplanten van verschillende tweede gewassen op de cultuur van Tabak in het gebied der Vorstenlanden op Java 1912–1920.** [Report of the experiments to determine the

effect of planting various secondary crops on the cultivation of Tobacco in the Vorstenland territory of Java during 1912 to 1920.]—*Meded. Proefstat. Vorstenlandsche Tabak*, lviii, 119 pp., 4 figs., 1 graph, 1 diag., 1927. [English summary.]

This is a very detailed account of an extensive series of experiments carried out on various estates in the Vorstenland territory of Java from 1912 to 1920 to determine the influence of the different rotation crops on the incidence of tobacco diseases [*R.A.M.*, iv, p. 318]. The results of the trials are presented in tabular form in addition to being fully discussed in the text.

It was shown that groundnut (*Arachis hypogaea*) and its varieties, chilli (various species of *Capsicum*), and native tobacco exercised a very injurious effect on the succeeding crops of plantation tobacco. Groundnut is highly susceptible to slime disease (*Bacillus* [*Bacterium*] *solanacearum*) [ibid., vi, p. 390], chilli to a disease closely resembling the same, and native tobacco to slime disease and *Phytophthora nicotianae*. Hence the tobacco following any of these crops is liable to contract the same diseases. On the other hand, maize, soy-beans (*Glycine soja*), and possibly dry-land rice, eggplant, and cassava are harmless to the succeeding tobacco crop, and it is therefore strongly recommended that they should be used as secondary crops on European tobacco plantations.

Neither cultivation methods nor the choice of fertilizers affected the incidence of disease in the experimental fields, with the exception of the use of 'dessa' manure infected by *P. nicotianae*, which is known to be transmissible in this manner [ibid., vi, p. 60].

VINSON (C. G.). **Precipitation of the virus of Tobacco mosaic.**—*Science*, N.S., lxvi, 1711, pp. 357–358, 1927.

A method has been devised of freeing the virus of tobacco mosaic from as much contaminating material as possible by freezing the freshly cut diseased tissues, allowing them to thaw, and then subjecting them to high pressure. The resultant juice, after being centrifuged at about 2,000 revolutions per minute and decanted off, contains no large particles in suspension but is highly infectious [*R.A.M.*, iv, p. 300].

When two volumes of acetone (c.p.) at $-8°$ C. are added to one volume of the juice held at about 0°, a flocculent precipitate is thrown out and rapidly settles. The supernatant liquid can be almost completely decanted within two minutes after adding the acetone, and more water may then be removed by rinsing the precipitate with acetone at $-8°$, decanting the latter, and removing the remaining acetone with absolute ether at $-8°$ by rinsing twice and thoroughly draining off the ether. The precipitate thus obtained is readily soluble in distilled water. Inoculations on young tobacco plants with this solution showed it to be highly infectious, while the first supernatant liquid, after being centrifuged and diluted with two parts of distilled water, was non-infectious. Absolute alcohol may be used in place of acetone under the abovementioned conditions.

At about 100 per cent. saturation and a temperature of $-8°$, ammonium sulphate salts out from the juice, material which, when

filtered off and sucked dry, dissolves readily in distilled water. Plants inoculated with this solution contract the disease. In no case was the disease transmitted by the filtrate when diluted, one to five, though the untreated juice, containing ammonium sulphate solution at a concentration of 3 c.c. of a saturated solution to 10 c.c. of the juice, is infectious.

Solutions of safranin-O have also been successfully used to precipitate the virus from the plant juice.

ALEXANDROFF (L. A.). 'Табачная пепелица' (**Oidium tabaci Thüm.**) на южном берегу Крыма в **1926** году. [Tobacco mildew (*Oidium tabaci* Thüm.) on the southern coast of the Crimea in 1926.]—*Материалы по Микологии и Фитопатологии* [*Materials for Mycol. and Phytopath.*], Leningrad, vi, 1, pp. 58–66, 1927.

The very considerable extension of the cultivation of tobacco in the southern Crimea of recent years (over 12,000 acres in 1926 as against 1,200 in 1922), and the fact that the great majority of the growers belong to the peasant class with but little experience of this industry, have created very favourable conditions for the epidemic spread of various diseases of the crop. Thus in 1926, mildew (*Oidium tabaci*) [? *Erysiphe cichoracearum*] was extremely prevalent everywhere, being most severe in the western part of the Yalta district where the Dubeck and Aya-Soulouk varieties of tobacco are chiefly grown. In the eastern part of this district, where a variety locally known under the name American is preferred, the incidence and severity of the disease were much less, and the author believes that this is due to the higher inherent resistance of this variety. Conservatively estimated, the losses to the growers caused by mildew in the Yalta district alone amounted to over 500,000 roubles [£50,000] in 1926, as in many cases whole plantations were so badly affected as to be considered not worth the labour of harvesting. The main cause of such a calamitous spread of infection is stated to have been the very wet winter and spring of 1926, followed by a damp and very hot summer, especially at altitudes between 300 and 650 m. above sea-level. The first infection foci were found to have formed at those levels, and the disease then spread to the plantations lower down. Spread was assisted by the custom of the local growers of leaving diseased plants standing in the fields, thus increasing the sources of infection.

As control measures, the author recommends thorough sanitation of the plantations; avoiding planting tobacco in places enclosed by trees and insufficiently ventilated and in proximity to plantations of Cucurbitaceae [cf. above, p. 273]; the selection of resistant varieties; and finally, strewing the lower leaves and the soil around the plants with sulphur, which must not be dusted on the leaves higher up, as it has been shown to injure the curing qualities of the tobacco.

CONANT (G. H.). **Histological studies of resistance in Tobacco to Thielavia basicola.**—*Amer. Journ. of Botany*, xiv, 8, pp. 457–480, 6 pl., 1927.

Microscopic examination of healthy roots taken from plants of seven varieties of tobacco (ranging from highly susceptible to

highly resistant), grown continuously for six weeks in sterilized soil and in soil infested with *Thielavia basicola*, at 20°, 25°, and 30° C., showed that in susceptible varieties, especially at 20°, pericyclic activity (which leads to the development of the cork layer) in the branch roots was delayed relatively as long as in the main roots. It did not keep pace with the stelar enlargement resulting from cambial activity, and a portion of ruptured epidermis and cortex was left unprotected by an underlying layer of cork for a long time in the angle between the two roots. In the highly resistant varieties the cork layers of both branch and main roots developed about the same time, and resulted in a continuous cork sheath. Relatively high temperatures, however, stimulate cork formation even in susceptible varieties; at 28° or more, pericyclic activity in these begins almost as early as in very resistant varieties at 20°. The most resistant variety of tobacco studied was Xanthia, and in this the pericycles of main and branch roots showed active division from the start of cambial growth until maturity, at all temperatures employed, while in moderately resistant varieties there may be a failure of the cork layer to develop for a time in plants grown at 20°. Sections through lesions taken from plants grown in infested soil showed a marked correlation between resistance to the fungus and this cork formation in the underlying tissues.

More than 50 per cent. of all the lesions examined occurred at the bases of branch roots. Direct penetration of cork layers by the fungus was not observed, except as a result apparently of the mass action of a weft of hyphae which gradually change the suberized walls to pectin-like substances that swell and eventually allow the fungus to break through. Root tips with the adjacent elongating regions appear to be immune from attack. The epidermis is much more resistant than the underlying tissue; after penetration of the epidermal layer, the primary cortex of all varieties except Xanthia allowed easy fungal invasion as, in most cases, the cortical tissues develop no phellogen and do not become suberized except as a result of open wounds. In strongly resistant strains of tobacco, however, or in strains made resistant by exposure to high temperatures, the host tissue under the invaded cells was stimulated to active cell division and formed a phellogen which arrested the progress of the fungus by proliferating cork cells towards the point of invasion. In extremely resistant primary roots, such as in Xanthia, this reaction may occur in the primary cortex. In very susceptible varieties at 20° there is no apparent resistance to the progress of the fungus by any of the tissues at any age of the root, the suberized and lignified cells only delaying the passage of the hyphae, and the vigorous reaction by the development of protective cork layers characteristic of Xanthia being absent.

The author concludes that resistance in tobacco to the root rot caused by *T. basicola* is correlated with the ability of the host to develop a cork layer under the point of infection, and that this reaction is accelerated by raising the soil temperature, until at from 26° to 30° and above, all varieties of *Nicotiana tabacum* become resistant to attack by *T. basicola*. The lower the tem-

perature at which a tobacco plant forms cork under a lesion, the greater is its resistance to *T. basicola*.

A bibliography of 19 titles is appended.

DORAN (W. L.). **Relation of the adjustment of soil reaction to black root-rot of Tobacco.**—*Science*, N.S., lxvi, 1722, pp. 661–662, 1927.

Previous investigations having shown (*Massachusetts Agric. Exper. Stat. Bull.* 229, 1926) that black root rot of tobacco (*Thielavia basicola*) causes practically no loss in soils more acid than P_H 5·6 and heavy damage at and above P_H 5·9 [see also next abstract], the writer experimented in 1926 on the relation of acidifying chemicals to the hydrogen-ion concentration of the soil and the control of the disease.

Acids were applied to infested soils of known P_H value. Equivalent quantities of nitric and sulphuric acid had practically the same effect on the P_H value of the soil, which was lowered in proportion to the quantity of acid used. Citric, malic, lactic, tartaric, and acetic acids lowered the P_H value of the soil when first applied, but it soon reverted to the original concentration. Orthophosphoric acid was much less effective than nitric or sulphuric acid in increasing the hydrogen-ion concentration of the soil.

Field experiments were conducted in a soil with a P_H value of 5·9, severely infested with *T. basicola*. During the growing season, the P_H value of this soil was lowered 0·10 and 0·15 to 0·20, respectively, by 200 and 400 lb. inoculated sulphur per acre, and 0·15 to 0·25 by a combination of 1,800 lb. sulphuric acid and 400 lb. orthophosphoric acid per acre. The yield of tobacco in treated plots, as compared with the controls, was increased 28 per cent. by 200 lb. sulphur, 34 per cent. by 400 lb., and 58 per cent. by the combined orthophosphoric and sulphuric acid treatment.

In pot experiments, the increased soil acidity resulting from the application of nitric and sulphuric acid was equally effective in preventing severe black root rot. Acetic acid also reduced infection to a minimum, probably by partial sterilization of the soil, since it has no permanent effect on the soil reaction.

The application of orthophosphoric acid to infested soil resulted in more severe root infection than that occurring on the control plants, and is thus similar to lime in its effects, but it gave a marked increase of growth.

The acids were all more toxic to tobacco plants in poorly buffered than in well buffered soil. Germinating seeds and seedlings were most severely injured by citric, malic, tartaric, and nitric acids.

MORGAN (M. F.) & ANDERSON (P. J.). **Relation of soil reaction to black root rot and good Tobacco.**—*Connecticut Agric. Exper. Stat., Tobacco Stat. Bull.* 8, pp. 47 T–58 T, 1 diag., 1927.

During a period of two years the writers have tested over 1,000 soils for acidity. In 1925 all cases of black root rot of tobacco [*Thielavia basicola*] were found on soils the reaction of which was above P_H 5·95 [see preceding abstract], but in the abnormally cold early summer of 1926 the disease was observed on slightly more

acid soils, indicating that, at any rate for shade tobacco, the safety point is near P_H 5·6.

McCubbin (W. A.) & Smith (F. F.). **Rate of virus spread in Tomato plants.**—*Science*, N.S., lxvi, 1716, pp. 486–487, 1927.

The writers have devised a method, free from the inaccuracies accompanying ordinary observation, of measuring the progress of virus in a plant system. A short series of preliminary tests was made to test the applicability of the method to the virus of tomato mosaic.

Eight tomato plants in pots were grown in such a way as to develop several horizontal branches, each of which was bent and led under the soil in a another pot to encourage rooting and thus form a readily detachable secondary plant. The organically connected but readily separable 'colony' thus produced was grown in a greenhouse under a close cheese-cloth cage, with strict precautions against accidental infection from any external source.

When all the secondary plants were well rooted but still attached to the parent, a single shoot of the latter was inoculated near the growing point with freshly expressed juice from mosaic tomato leaves. After inoculation a single secondary plant was removed from each colony at intervals of 3, 10, 15, 19, and 24 days and grown under observation.

Twenty-four days after inoculation it was found that the inoculation had failed in two of the colonies, while the remaining six all showed positive results after 19 days. In three plants the virus had reached the secondary plants by the 10th day after inoculation and in five by the 15th, while none of the plants removed after three days had developed mosaic by the 24th day.

The distances to be traversed by the virus in these colonies ranged from 8 to 18 inches, and they were shown by the above tests to be covered in periods of from somewhat under 10 to slightly more than 15 days. Although there is no evidence that a uniform advance was made during this period, it may be roughly estimated that the transfer of mosaic virus takes place through tomato shoots at a rate of one to two inches daily or one to two mm. hourly.

Brewer (P. H.), Kraybill (H. R.), & Gardner (M. W.). **Purification of the virus of Tomato mosaic.**—*Phytopath.*, xvii, 10, p. 744, 1927.

Two methods have been used to free the virus of tomato mosaic from the various constituents of the plant juice. In one, the juice from crushed mosaic plants was passed through a sintered glass filter, the residue on which was repeatedly washed with distilled water until the filtrate was colourless. The residue was then suspended in distilled water, and the clear filtrate obtained was shown to contain the virus by inoculation of young plants. In the second and more effective method, the juice from crushed plants was centrifuged at 35,000 revolutions per minute and the fairly clear supernatant liquid passed through a powdered charcoal filter. The powdered charcoal was then washed with distilled water until the filtrates were clear and colourless, after which the virus was

liberated from the charcoal and obtained in a clear and colourless water suspension, which was shown by inoculation to be infectious.

KRAYBILL (H. R.) & ECKERSON (SOPHIA H.). **Tomato mosaic. Filtration and inoculation experiments.**—*Amer. Journ. of Botany*, xiv, 8, pp. 487–495, 2 pl., 1927.

A detailed account is given of the authors' experiments in the filtration of tomato mosaic virus, a preliminary notice of which has already appeared [*R.A.M.*, vi, p. 449]. Mosaic tomato plants were ground in a Nixtamal mill and the juice was pressed out by means of a tincture press. It was then filtered through fritted glass filters (Empire Laboratory Supply Co.), either without further treatment, or the colloidal substances were first partially removed by centrifuging the juice, digesting with enzymes, or allowing it to stand in an ice box. Healthy young tomato plants were inoculated with the different fractions, usually by scoring the leaf with a sterilized steel needle before and after placing a drop of the preparation on the surface.

The results [which are tabulated] showed that the residues from the glass filters usually produced 100 per cent. mottling. The filtrates produced no definite effects after a single inoculation, but after being inoculated three times, at intervals of two days, approximately 50 to 75 per cent. of the young plants developed fern-leaf symptoms without mottling. The plants were extremely dwarfed, and bore small, rather smooth, glistening leaves. Many of the leaflets were deeply cut owing to the small development of leaf-blade tissue between the veins.

When the colloidal substances were partially removed from the juice before filtering, the mottling principle passed through the glass filters (which had pores about 4 μ in diameter and readily permitted the passage of *Bacterium tumefaciens* when clean). When these filtrates containing the mottling principle were filtered through collodion membranes, the mottling principle was removed but the filtrates produced fern-leaf symptoms. Experiments indicated that the juice from plants showing only fern-leaf symptoms was not infectious.

SHAPOVALOV (M.). **Inoculation experiments with western yellow Tomato blight in relation to environmental conditions.**—Abs. in *Phytopath.*, xvii, 10, p. 746, 1927.

It has been conclusively shown that the virus of curly top of sugar beet may be transmitted to tomato plants by the leafhopper *Eutettix tenella* and produce, under specific environmental conditions, symptoms indistinguishable from western yellow tomato blight [*R.A.M.*, vi, p. 455]. It was practically impossible to attain all the field symptoms under greenhouse conditions, particularly with caged plants, but perfect specimens of blight were produced with tomatoes grown outdoors unprotected or in light muslin cages.

Shading retards and partially prevents the progress of the disease. Light and humidity appear to be the most important factors in developing the field symptoms. High temperature may

shorten the incubation period but the characteristic symptoms are not produced in the absence of proper conditions of light and humidity. The resistance of the host may be modified by age or other factors.

The substitution of the name 'tomato yellows' for 'western yellow tomato blight' is suggested on grounds of brevity, accuracy, and in order to include similar diseases of other crops.

BONDARTZEVA-MONTEVERDE (Mme V. N.). Некоторые дополнительные данные к наблюдениям над **Phytophthora infestans (Mont.) de By.** на Томатах. [Some complementary observations on *Phytophthora infestans* (Mont.) de By. on Tomatoes.]—*Morbi Plantarum*, Leningrad, xvi, 1, pp. 76–81, 1927. [German summary.]

With reference to Siemaszko's paper [*R.A.M.*, v, p. 524] on *Phytophthora infestans* on potatoes and tomatoes in Poland, the present author does not accept the former's recognition of a biological strain of the organism proper to the tomato, since, as pointed out in her previous communication [ibid., v, p. 703], and as confirmed by her subsequent experiments, the form from potato leaves was always found pathogenic to the tomato, and vice versa [but see ibid., vi, p. 583]. It was also established that when the potato form was inoculated on the tomato, the shape and dimensions of the conidia changed considerably, approaching those of the form proper to the latter host, and they resumed their original characters when the organism was re-transferred to the potato. The tomato form behaved in the same manner when inoculated on the potato. She concludes, therefore, that the variations noted by various authors in the size and dimensions of the conidia are dependent on the nature of the substratum, and also that these characters are not of systematic value for the distinction of species in the genus *Phytophthora* [cf. ibid., vii, p. 59].

LUDWIGS (K.). **Starkes Auftreten des Tomatenkrebses.** [Severe occurrence of Tomato canker.]—*Obst- und Gemüsebau*, lxxiii, 21, pp. 324–325, 2 figs., 1927.

Attention is drawn to the severity of the outbreaks of tomato canker (*Didymella lycopersici*) occurring in Germany during 1927 [*R.A.M.*, vii, p. 126]. A special feature of the attacks was the entrance of the fungus through wounds, e.g., those inflicted by the bast used for tying up the plants or by the removal of shoots or flowers. The symptoms of the disease are briefly described and concise directions given for its control by cultural measures, supplemented by spraying with 1 per cent. Bordeaux mixture or 0·25 per cent. uspulun.

BONDARTZEVA-MONTEVERDE (Mme V. N.). К биологии **Colletotrichum lycopersici Chester.** [Contribution to the biology of *Colletotrichum lycopersici* Chester.]—*Morbi Plantarum*, Leningrad, xvi, 1, pp. 70–76, 1 fig., 1927. [German summary.]

The author gives a detailed description of the morphology of *Colletotrichum lycopersici*, which was found in 1924 on one fruit only of a tomato plant in the experimental hothouse of the Chief

Botanic Garden in Leningrad, this being, as far as she is aware, the first record of the fungus in Russia. The organism, of which the morphological characters agree with Chester's diagnosis, was grown in pure culture on various media, and used in inoculation experiments which showed that immature fruits were less susceptible than those that approached maturity, and that infection occurred better through wounds than through the uninjured epidermis of the fruits. All attempts to induce the formation of an ascogenous stage gave negative results. Seedlings raised from seeds from diseased tomatoes remained entirely healthy, although somewhat less vigorous than the controls, throughout their whole vegetation. In enumerating other species of *Colletotrichum* and *Gloeosporium* known to attack tomatoes, the great similarity is pointed out between the diagnoses of *C. lycopersici* and *C. phomoides*, but as the author could not examine Chester's original material, she is not able to form an opinion on the identity of the two species.

WEDGWORTH (H. H.). **Wilt-resistant Tomato varieties in 1927.** —*Quart. Bull. State Plant Board Mississippi*, vii, 3, pp. 3–4, 1927.

Fourteen tomato varieties were grown on infected and non-infected soil at the Mississippi Experiment Station in 1927 to test their reaction to wilt (*Fusarium*) [*lycopersici*], the annual loss from which in the southern States is estimated at 15 to 20 per cent. of the crop. The following were found to show varying degrees of resistance: Louisiana Pink, Marglobe, Kanora, Louisiana Red, Norton, Marvelosa, Marvel, Marvana, and Columbia [*R.A.M.*, vii, p. 19]. On both infected and healthy soil Louisiana Pink was the most productive and Columbia the least so, the yield of the former being 5 tons per acre on infected and 7·6 tons on healthy soil, and that of the latter 2·6 and 4·4 tons, respectively.

HARTLEY (C.). **Forest genetics with particular reference to disease resistance.**—*Journ. of Forestry*, xxv, 6, pp. 667–686, 1927.

The value of plant breeding in food and fibre crops is now generally recognized, but forest pathologists have yet to be convinced that hereditary improvement in forest trees can be obtained quickly enough to justify the effort required. The author believes that properly planned work in this direction will yield good results, and in this paper discusses the subject from the point of view of the pathologist.

After summarizing the available information concerning some of the more interesting hybrids between forest species, the author cites several cases where differences in resistance and in other characters between trees of the same species growing in the same locality have been reported to be hereditary. With reference to some activities in forest genetics, it is mentioned that larch is being hybridized in Russia in the hope of obtaining greater resistance to insects and larch canker (*Dasyscypha*) [*willkommii*: see above, p. 209], a disease which Spaulding has just discovered in the United States [see next abstract]. Suggestions are made for the investigation of certain fundamental problems of genetics and in the concluding

section several instances are given where studies may be expected to give results of immediate application, including breeding for increased resistance against the following diseases: chestnut blight (*Endothia parasitica*), which appears to be controllable only by the development of a resistant strain; sycamore anthracnose (*Gnomonia veneta*), striking differences in resistance to which have been observed in individual sycamores [plane trees] (*Platanus* sp.); poplar cankers, caused by *Dothichiza* [*populea*: *R.A.M.*, vii, p. 129], which has seriously affected the cultivation of Norway poplar (*Populus eugenei*) in the Ohio Valley, as well as by *Cytospora chrysosperma* [ibid., iii, p. 244], which greatly restricts the use of poplars for paper production; and white pine blister rust (*Cronartium ribicola*).

As regards the last-named, the white pine (*Pinus strobus*) is the only host giving promise of early results in the increase of resistance. The general level of resistance of *P. strobus* to rust is probably higher than that of the chestnut to blight, and hereditary improvement will be supplemented by *Ribes* eradication work. The writer advocates a preliminary examination of the proposed parent trees in order to ascertain their degree of hereditary resistance. At least fifty descendants should be secured by means of graft propagation, the resulting clones being planted in a generally infected region, alternating with rows of ordinary seedlings and of grafted stock from ordinary trees. Susceptible species of *Ribes* should be planted among the seedlings in sufficient numbers to give a good differential test of resistance to infection. After ten or fifteen years the ordinary seedlings and less resistant clones should be eliminated and replaced by additional grafts from the trees with resistant progeny. A modification of this method, involving the development of resistant progeny by controlled crosses between resistant individuals, is briefly described.

SPAULDING (P.) & SIGGERS (P. V.). **The European Larch canker in America.**—*Science*, N.S., lxvi, 1716, pp. 480–481, 1927.

In April, 1927, European larch [*Larix europaea*] was found affected with the canker caused by *Dasyscypha calycina* [see preceding abstract] in Massachusetts. Subsequently the disease was found on *L. leptolepis*, *L. laricina*, Douglas fir (*Pseudotsuga taxifolia*), *Pinus rigida*, and *P. sylvestris* in the same area. The origin of the disease was conclusively indicated by the fact that *L. europaea* and *L. leptolepis* on two of the four estates infected came as seedlings from Scotland in 1904 and 1907, respectively, old cankers being found on wood that must have been formed when the trees were imported. Some of the diseased Douglas fir is also known to have been imported as seedlings.

PHILLIPS (J.). **Mortality in the flowers, fruits and young regeneration of trees in the Knysna forests of South Africa.**—*Ecology*, viii, 4, pp. 435–444, 1927.

In connexion with a study of the causes of mortality in plant communities in South Africa, attention is directed to the influence of fungi in the reduction of germination. *Fusarium* spp. are responsible for the death of many developing plants of *Podocarpus*

elongata, *P. thunbergii*, *Cunonia capensis*, *Ocotea bullata*, *Olinea cymosa*, and *Myrsine melanophleos*. *O. cymosa* is also liable to infection by *Capnodium* sp. and *Asterina reticulata*, while the young drupes of *M. melanophleos* are severely attacked by *Corynelia fructicola* v. Höhn. *C. uberata* Fr. is an important parasite of the flowers and fruit of *P. thunbergii* but is inhibited by warm, dry weather at flowering time. *Rhizoctonia* sp. also occurs in a parasitic form on the roots of this species. A species of *Pestalozzia* closely resembling *P. hartigii* greatly diminishes the germination of *Apodytes dimidiata*.

WOLLENWEBER (H. W.). **Das Ulmensterben und sein Erreger, Graphium ulmi Schwarz.** [The die-back of Elms and its causal organism, *Graphium ulmi* Schwarz.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 10, pp. 97–100, 2 figs., 1927.

The writer undertook a series of experiments (a full account of which will be published elsewhere) to determine the validity of the various theories which have been advanced to explain the etiology of the Dutch elm disease [*R.A.M.*, vii, p. 127].

Wound inoculations on healthy one- to three-year-old mountain elms (*Ulmus montana*) with pure cultures of *Graphium ulmi*, isolated from *U. montana*, *U. campestris*, and *U. americana* in various parts of Germany, produced the typical wilting and internal discoloration in every case in five weeks, showing that this organism is the primary cause of the disturbance. The fungus, which develops sclerotia measuring 45 μ and conidia 3·4 by 1·6 μ, was reisolated from all the infected trees. Similar experiments with *G. ulmi* on maple, lime, hawthorn [*Crataegus*], and poplar seedlings gave negative results, while the characteristic external and internal symptoms of die-back [which are described] were absent in elms and other trees inoculated with species of *Fusarium*, *Phoma*, *Cylindrocarpon*, and the like, obtained from the bark of elms. There was, however, a spontaneous outbreak of wilt on maple (*Acer negundo*) seedlings, which was found to be due to *Verticillium dahliae* [ibid., vi, p. 135]. It is not yet known whether *G. ulmi* is transmissible from elms to other trees. No perfect stage of the fungus has been found but it is suggested that it is allied to the fungi causing the blueing of coniferous wood (*Ceratostomella* spp.), and it is noteworthy that *C. quercus*, the conidial stage of which is a *Graphium*, has recently been described as a parasite of the pedunculate oak [*Quercus pedunculata*] in France [ibid., vii, p. 206].

The selection of resistant varieties, such as *U. vegeta* and *U. fulva*, both of which have apparently escaped infection so far, appears to present the best prospect of control.

Destructive Insects and Pests Act, 1927.—3 pp., H.M. Stationery Office, London, 1927.

This Act, which received the Royal Assent on 22nd December, 1927, amends the act of 1907 and empowers the Ministry of Agriculture in England and the Board of Agriculture in Scotland to take action against virus and bacterial as well as against fungous diseases. Compensation for the loss of crops destroyed to prevent

the spread of any pest may be paid up to £2,000 in any one year without the consent of the Treasury. The maximum penalty for second or subsequent offences against the Act is raised from £10 to £50, and authority is given to charge fees for certificates given for the inspection of crops.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, 11, pp. 196–204, 1927.

As from 21st July, 1927, all plants and parts thereof with soil adhering, imported into Denmark, must be accompanied by a certificate stating that their place of cultivation is free from infection by potato wart (*Synchytrium endobioticum*) and situated at least 5 km. from any area in which this disease has been reported during the last five years. As regards the importation of potatoes themselves into Denmark, the zone of freedom from wart disease is raised from 5 to 30 km. [*R.A.M.*, vi, p. 320]. In each consignment imported, at least five out of every hundred sacks must be examined for freedom from the slightest trace of infection by *S. endobioticum*, while the incidence of other fungous rots, including late blight [*Phytophthora infestans*], must not exceed 5 per cent.

Gesetze und Verordnungen. [Laws and regulations.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, vii, 12, p. 124, 1927.

A supplementary clause of the Danish regulations governing the importation of potatoes [see preceding abstract] provides for certain concessions to Danish importers obtaining material from countries with a reliable and well-organized plant protection service, e.g., Holland and Germany. But all consignments must be accompanied by a certificate stating that the potatoes were grown at least 30 km. from any area in which wart disease (*Synchytrium endobioticum*) has been reported during the last five years.

The Royal Phytopathological Station in Rome has sanctioned the special form of certificate for the dispatch of potato consignments from Germany to Italy drawn up by the Göttingen plant protection head-quarters and the Italian expert for Germany, Prof. Traverso of Milan.

As from 17th November, 1927, all consignments of potatoes for Poland must be accompanied by a certificate of freedom from wart disease and a guarantee that the plants were grown at a distance of at least 20 km. from any locality in which this disease has been reported to occur [*R.A.M.*, v, p. 256].

Rules and regulations made by the State Plant Board pursuant to the Florida Plant Act of 1927.—*Monthly* (formerly *Quart.*) *Bull. State Plant Board of Florida*, xii, 4, pp. 77–114, 1927.

The following regulations, effective as from 1st January, 1928, relate to the control of fungous diseases of citrus in Florida. All plants found to be infected by citrus canker (*Pseudomonas citri*) [*R.A.M.*, v, p. 280] shall be destroyed by burning and the ground burnt for a distance of three feet beyond the utmost spread of the branches of the infected plant. The movement of citrus plants situated within one mile of any centre of infection (i. e., any infected

grove, nursery, or individual plant) is subject to the discretion of the Plant Board, and no plants may be moved, except under the supervision of this body, from a zone extending half a mile in every direction from the said centre until, in the judgement of the Board, the dangerous conditions have ceased to exist. The movement of plants other than citrus from infected areas is also suspended until the re-establishment of healthy conditions. The planting, cultivation, and harvesting of any crop or the entry of livestock in an infected or suspected grove or nursery is to be suspended, and all operations in such areas must be conducted under the supervision of agents of the Plant Board. Similar regulations apply to the packing and other handling of citrus fruit from infected areas. No citrus fruit may be introduced into Florida by any means whatsoever from Georgia, Alabama, Mississippi, Louisiana, or Texas.

No certificate of inspection shall be issued to cover the citrus stock in any nursery in which [Florida] scaly bark (*Cladosporium herbarum* var. *citricolum*) [ibid., vi, p. 401] is present or has been found within a period of six months preceding, or that in nurseries adjacent to a known scaly bark infection.

No citrus fruit may be introduced into Florida from California on account of brown rot (*Pythiacystis* [*Phytophthora*] *citrophthora*).

Copies of the certificates and notices to be used and other legislative information are included, while an appendix contains a summary of the Post Office regulations relative to parcel post consignments.

A table included in the report of the Citrus Canker Eradication Department, issued as a supplement to these regulations, shows the number of trees found infected during each month from the beginning of the campaign in May, 1914 to 30th September, 1927, when only one property was still reported as being a danger centre.

Legislative and administrative measures. Mexico.—*Internat. Bull. of Plant Protect.*, i, 10, pp. 161–162, 1927.

A Regulation dated 18th April, 1927, authorizes the Mexican Secretariat for Agriculture, acting through the Office for Crop Protection, to inspect any area in order to determine what crop pests and diseases may be present, and to apply authorized preventive and control measures. The Secretariat may mark out zones of defence, in which the introduction or transport of any plant material scheduled as affected is prohibited unless disinfected and accompanied by a health certificate from a recognized agent of the Federal Government. Disinfection and the issue of health certificates are charged at a fixed rate, the revenue from these sources being devoted to the phytosanitary service. Owners or occupiers of agricultural estates within a zone of defence must report the presence of any disease and apply the control measures indicated by the Office for Crop Protection, otherwise steps will be taken by the agents of the Office at the expense of the persons concerned.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

APPLIED MYCOLOGY

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WILSON (M.) & WILSON (M[ARY] J. F.). **The occurrence of the Dutch Elm disease in England.**—*Gard. Chron.*, lxxxiii, 2142, pp. 31–32, 4 figs., 1928.

After giving a brief account of the history and symptoms of the Dutch elm disease [*R.A.M.*, vii, p. 286], the writers draw attention to the discovery, in July, 1927, of several cases of infection occurring near together in an area near London, notwithstanding the official regulations prohibiting the importation of living elm plants [ibid., vi, p. 384]. It is thought probable that the disease was already present before legislation was introduced in 1926, as a number of the trees referred to were reported to have shown in that year the typical symptoms of discoloration of the leaves and defoliation preceding death. One of the trees found affected in July, 1927, was re-examined in October, by which time the discoloration had become intensified and extended to almost all the branches on one side. Sections through the infected material showed the characteristic ring of brown spots in the wood, which was, however, absent from the roots.

Graphium ulmi developed in 80 per cent. of the cultures obtained from the discoloured wood of this tree, but in addition, coccoid and a few rod-shaped bacteria appeared in a large proportion of the liquid cultures. These results are strikingly similar to those obtained with authentic continental material. Moreover, the history of the death of the London elms and the symptoms exhibited by the individuals examined on the spot agree in every detail with those of the Dutch disease. It is considered particularly significant that *G. ulmi*, which appears from Wollenweber's experiments [loc. cit.] to be the causal organism of the disease in Germany, should have been isolated from such a high proportion of the English material.

The severity of the epidemic in Holland, Belgium, and western Germany shows no signs of abating. In the first-named country the planting of elms along the dykes and streets has been discontinued. There is stated to be no definite proof that the disease attacks any tree outside the genus *Ulmus*, within which the different species show varying degrees of resistance, though none appears to be immune. Of the various methods of control attempted

on the Continent, spraying and the autumn pruning of infected branches have proved useless, but the removal and burning of entire trees (including the roots) may arrest the spread of the disease in the early stages. Judging by the rapidity with which infection spreads on the Continent, it is very unlikely that the Dutch elm disease will remain confined to one area in England. In view of the urgency of the situation and of the need for immediate control, it is most important that all suspected cases should be reported without delay.

TURC (L.). **Note sur le dépérissement du Chêne pédonculé dans les forêts du plateau nivernais.** [Note on the dying-off of the pedunculate Oak in the forests of the Nivernais plateau.] —*Rev. Eaux et Forêts,* lxv, 11, pp. 561–565, 1927.

The devastation of the pedunculate oak [*Quercus pedunculata*] in many parts of the Nivernais plateau [central France] by *Oidium* [*Microsphaera quercina*] in association with insects and *Armillaria mellea* [*R.A.M.*, vii, p. 126] is attributed primarily to the influence of unfavourable environmental conditions and unsuitable silvicultural methods.

MAUCKE. **Ein Beitrag zur Bekämpfung von Phytophthora omnivora.** [A contribution to the control of *Phytophthora omnivora*.]—*Forstarch.*, iii, 20, pp. 355–356, 1927.

In 1924 the writer obtained excellent control of *Phytophthora omnivora* on beech seedlings [*R.A.M.*, vi, p. 326] by spraying with 1 per cent. Bordeaux mixture, combined with the removal of recognizably infected plants. The fungus had not previously been observed in the affected area or in the adjacent plots, and it must therefore have been introduced on imported seedlings.

BOYCE (J. S.). **Lophodermium infestans Mayr a synonym of Hypoderma robustum Tubeuf.**—*Mycologia*, xix, pp. 284–285, 1 fig., 1927.

The author states that he has examined specimens from the Farlow Herbarium labelled '*Lophodermium infestans* Mayr on *Abies concolor*. Type of Mayr' that appear to have come from Mayr himself, who published the name without a description in his book 'Die Waldungen von Nordamerika', Munich, 1890. They proved to agree with the fungus later described on the same host by Tubeuf, from Mayr's collections, as *Hypoderma robustum*. The average measurements of 50 spores (without the gelatinous sheath) of the Herbarium material were 29 by 4 μ while those given by Tubeuf were 30 to 36 by 3 μ. As Mayr's name is a *nomen nudum*, *H. robustum* Tubeuf stands.

HIRATSUKA (N.). **On two species of Coleosporium parasitic on the Japanese Compositae.**—*Trans. Sapporo Nat. Hist. Soc.*, ix, 2, pp. 217–224, 1927.

In this paper the writer records the results of a study on the genetic relations of *Coleosporium eupatorii* and *C. saussureae*. From 1923 to 1926 the former species was collected on *Eupatorium japonicum* and *E. sachalinense*. In the spring of 1924 spermo-

gonia of the *Coleosporium* type were found on two-year-old needles of *Pinus koraiensis* growing near the rusted *Eupatorium*, and in the following May aecidia of the *Peridermium* type developed on the needles. Inoculation tests with these aecidia on the leaves of *E. sachalinense* gave positive results, uredosori appearing in 9 to 14 days and teleutospores in three weeks. A similar experiment was carried out with the aecidia of a *Peridermium* collected on *Pinus pumila* growing near plants of *Saussurea riederi* infected by *C. saussureae*. Ten days later uredosori appeared on the leaves of the inoculated plants of *S. riederi*.

ALCOCK (Mrs. N. L.) & WILSON (M.). **Armillaria mellea on Heather.**—*Scottish Forestry Journ.* (*Trans. R. Scottish Arbor. Soc.*), xli, 2, pp. 224–225, 1927.

On 20th September, 1927, some plants of heather (*Calluna vulgaris*, vars. *alba, alportii*, and *pygmaea*) which were evidently being killed by a fungous disease were sent to the Royal Botanic Garden, Edinburgh. The soil accompanying the specimens was full of a white mycelium producing rhizomorphs, which were isolated and not actually growing on the roots. The stem bases of infected plants were covered all round with a plate of white mycelium lying between the wood and the bark. This occurred just below soil-level and extended up the stem for about two inches; patches could also be found on some of the larger branches. The mycelium formed a weft of closely woven white hyphae below the bark, and the cambium was apparently destroyed by it. In places the mycelium ran up under the bark in thick, white strands.

A second batch of heather showed rhizomorphs connected with the plants, a characteristic 'shoe-string' being observed in one case. Typical black lines occurred in the wood internally. Further investigation showed extensive infection by *Armillaria mellea*, which had probably spread from adjacent diseased oak and pine stumps.

WEHMER (C.). **Lignin und Huminstoffe bei der pilzlichen Holzzersetzung.** [Lignin and humin substances in the fungous decay of wood.]—*Ber. Deutsch. Bot. Gesellsch.*, xlv, 8, pp. 536–539, 1927.

Previous literature on the chemical processes associated with the fungous decay of wood is briefly summarized, with special reference to Falck's recent investigations [*R.A.M.*, vi, p. 453]. This writer's claim to be the first exponent of the views which he expresses regarding the formation of acid raw humus from wood by the action of fungi is disputed, on the grounds of Hartig's earlier researches ('Zersetzungserscheinungen des Holzes', 1878). Referring to his own work on the conversion of lignin, cellulose, and wood substance into humin by fungi (*Merulius lacrymans* and *Coniophora*) [*cerebella*: ibid., iv, p. 628], the author draws a further distinction between white and brown rot. The former corresponds to a mild oxidation and the latter (humification) is primarily a hydrolytic process. It is suggested that the formation of humin in decayed wood may be a natural chemical process which is only indirectly connected with the action of fungi.

HARBACH. **Die Konservierung des Holzes im Walde.** [The preservation of wood in the forest.]—*Forstarch.*, iii, 20, p. 356, 1927.

In connexion with the recent article on timber preservation in the forest [*R.A.M.*, vi, p. 647], the writer advocates cutting the wood for fence posts, etc., to the exact requisite length and shape prior to treatment, since the copper sulphate used in the latter process is apt to blunt the tools. Benzolina, an inflammable substance which should be applied cold, is also recommended for preservative purposes.

FALCK (R.). **Sechs Merkblätter zur Holzschutzfrage.** [Six leaflets on the question of wood preservation.]—*Hausschwammforsch.*, viii, 71 pp., 3 figs., 7 diags., 1927.

In leaflet 1 the writer distinguishes eight separate types of wood decomposition, namely, (1) stem rots (mainly associated with *Trametes pini*); (2) root rots, represented by *Polyporus* [*Fomes*] *annosus*, *Agaricus melleus* [*Armillaria mellea*], etc.; (3) wound rots (*Polyporus stipticus* on pine, *Pholiota adiposa* on fir, and *P. aurivella* and *P. squarrosa* on beech); (4) discoloration of various kinds, e.g. blueing of conifers caused by *Ceratostomella* spp.; (5) soil rots, affecting wood left on the ground in the forest; (6) storage rots, affecting wood in timber yards and the like; (7) dry rots due to *Coniophora* [*cerebella*], *Poria vaporaria*, and other fungi injuring structural timber; and (8) dry rot proper (*Merulius domesticus*), the chief characters of which are tabulated to distinguish it from the forest form, *M. silvester*, and the small dry rot form, *M. minor* [these three forms are usually included under the name *M. lacrymans*].

Leaflet 2 deals with general and industrial timber preservation, directions being given for the various methods applicable at different stages of preparation from felling to transport.

In leaflet 3 the properties, application, and modes of testing of the principal timber preservatives are discussed. The efficacy of the low boiling hydrocarbons of the aromatic series has been amply demonstrated [*R.A.M.*, v, p. 398], but owing to their toxicity these substances can only be used to a very limited extent in dwelling-houses. The outstanding conclusion reached by the author as a result of his investigations is that only two of the elements merit consideration as wood preservatives, viz., fluorine and arsenic. An increased fungicidal activity of coal-tar oil may be secured by the addition of xylol or other low boiling hydrocarbons as well as by the admixture of colouring bases. Corrosive sublimate is unsuitable for domestic use by reason of its toxicity and also on account of its prohibitive cost. The fixation of the water-soluble compounds of fluorine and arsenic may also be effected by the admixture of one of the above-mentioned colouring bases of the triphenyl methane group, so that their leaching out is prevented and their fungicidal activity prolonged.

In the fourth leaflet the rules for the chemical treatment of constructional timber are formulated, and directions are given for the recognition of various defects disqualifying the wood for building purposes.

Leaflet 5 supplies information on the prophylactic and remedial measures against dry rot in buildings, with special reference to a new method of treatment known as 'mychalation', whereby the wood is sterilized in the initial stages of decay by the fumes of toxic gases.

Leaflet 6 deals with the maintenance in a dry condition of walls and woodwork, stress being laid on the importance of this measure, in conjunction with chemical preservation, as a preventive of fungous infection.

The use of untreated wood for constructional purposes has long been regarded by the writer as a serious technical defect, and his views on this subject are recapitulated in the last three leaflets.

MOLL (F.). **Die Bedeutung des Sublimats als Holzimprägnationsmittel.** [The importance of sublimate as a wood preservative.]—*Zeitschr. Angew. Chemie*, xl, 41, pp. 1137–1140, 1927.

The writer's extensive experience of timber preservation has convinced him that the best practical results are to be expected from the use of corrosive sublimate, followed by dinitrophenol-aniline or dinitrophenol-sodium, copper sulphate, and zinc chloride, in the order named [*R.A.M.*, vi, p. 764]. Approximately the same positions are occupied by these preparations as regards fixation, but penetration is in inverse ratio to fixation. Recent unpublished investigations by K. A. Hofmann have shown that the admixture of sodium fluoride with corrosive sublimate increases the penetration of the latter. The mercury oxychlorides formed during the fixation of corrosive sublimate also exercise a protective action.

The excessively high cost of the organic mercury compounds proposed as timber preservatives has hitherto prevented adequate trials of their suitability for this purpose.

CURTIN (L. P.). **Experiments in wood preservation. III. Preservative properties of basic substances.**—*Indus. & Engin. Chem.*, xix, 10, pp. 1159–1161, 1927.

Continuing his investigations on wood preservation [*R.A.M.*, vii, p. 213], the author found that the carbonates of sodium and barium were sixteen times as toxic to *F. annosus* as the corresponding chlorides, while those of strontium and calcium were, respectively, three and five times as toxic as the corresponding chlorides.

The killing points for *F. annosus* of the various salts tested were as follows (reckoned in percentages): Na_2CO_3, 0·33: $BaCO_3$, 0·625; $BaCl_2$, 11·0: $SrCO_3$, 3·0; $SrCl_2$, 10·0; $CaCO_3$, 1·5: $CaCl_2$, 8·0; $ZnCl_2$, 0·35; $Zn(OH)Cl$, 0·30; and $Zn(OH)_2$, 0·30. The hydroxide and oxychloride of zinc, though not readily soluble, are fully equal in toxicity to the highly soluble zinc chloride because of the solvent action of the acid produced by the fungus. Sodium carbonate is as toxic as zinc chloride, but lacks permanence on exposure to rain. Barium carbonate is only 55 per cent. as toxic to *F. annosus* as zinc chloride, but its non-corrosive nature, low electrical conductivity, and permanence entitle it to trial as a timber preservative.

CURTIN (L. P.) & BOGERT (M. T.). **Experiments in wood preservation. IV. Preservative properties of chlorinated coal-tar derivatives.**—*Indus. & Engin. Chem.*, xix, 11, pp. 1231–1240, 1 graph, 1927.

The chlorination of the hydrocarbon fraction of coal-tar creosote was found to reduce its toxicity towards *Fomes annosus* [see preceding abstract]. On the other hand, the mono- and dichloro derivatives of certain coal-tar phenolic bodies are less volatile, less soluble in water, more resistant to oxidation, and much more toxic towards wood-rotting organisms than the unchlorinated parent substances. Chlorination of the cresols and xylenols gave the greatest increases in toxicity, dichloroxylenol being the most toxic of all the substances tested (8 to 10 times as toxic as unchlorinated xylenol and 100 to 150 times as toxic as commercial creosote). The toxicity of this substance was found to be definitely greater than that of mercuric chloride, arsenious oxide, or dinitrophenol, and also than that of the chlorinated or unchlorinated phenols above and below it in molecular weight.

The monochloro derivative was found to be about three times as toxic as the unchlorinated material. The chlorination of tar acids boiling above 270° C. resulted in a slight decrease in toxicity, probably associated with a reduction of solubility in water.

Experiments are in progress at the laboratories of the Western Union Telegraph Company in the treatment of southern yellow pine [*Pinus palustris*] with asphaltic base petroleum containing 1 to 10 per cent. chloro tar acid. No difficulty was presented by the treatment and the penetrations were noticeably better than when petroleum alone was used.

CURTIN (L. P.), KLINE (B. L.), & THORDARSON (W.). **Experiments in wood preservation. V. Weathering tests on treated wood.**—*Indus. & Engin. Chem.*, xix, 12, pp. 1340–1343, 4 graphs, 1927.

Weathering tests are described in which southern yellow pine [*Pinus palustris*] sap wood treated with various preservatives was cut into sections and exposed in overhead trays for ten months to the action of wind, sun, and rain. Chemical analyses were made on the weathered wood to determine the loss of preservative caused by leaching, evaporation, and oxidation, while toxicity tests were made to ascertain its resistance to *Fomes annosus* [see preceding abstracts]. The best protection against infection by this organism was given by treatment with zinc meta-arsenite, copper aceto-arsenite, and copper arsenite. Barium carbonate, zinc chloride, sodium fluoride, creosote, and petroleum were inferior to the foregoing in toxicity and permanence.

SĂVULESCU (T.) & SANDU (C.). **Rumania: experiment trials on formol treatment of Sugar Beet seed.**—*Internat. Bull. of Plant Protect.*, i, 9, pp. 142–143, 1927.

A bacterial gummosis of sugar beet appeared in Rumania, especially in the Danube valley, during the summer of 1924 [*R.A.M.*, v, p. 13], the losses incurred by growers and manufacturers ranging from 60 to 100 per cent. The causal organism is

said to be a coccus but is not described. Field trials, in which seed was treated for one hour with a 0·025 solution of commercial formalin, placed in the sun, and sown while wet, resulted in a greatly increased yield from the treated seed, the roots also having a greater sugar content.

CARTER (W.). **Ecological studies of curly top of Sugar Beets.**—Abs. in *Phytopath.*, xvii, 10, p. 747, 1927.

The development of severe symptoms of curly top in beets appears to be favoured by high light intensity, temperature, and evaporation. The same factors seem to affect the number of positive results obtained by inoculation. Experiments on the control of the external environment by means of spraying with various pigments resulted in significant differences of yield.

BURGWITZ (G. K.). Бактериальное поражение цветов Тыквы. [Bacterial disease of the flowers of Vegetable Marrow.]—*Morbi Plantarum*, Leningrad, xvi, 1, pp. 43–49, 1927. [German summary.]

A description is given of a bacterial disease of the pistillate flowers of vegetable marrows (*Cucurbita pepo*) which was observed for the first time in 1924 in a hothouse at the Chief Botanic Garden in Leningrad. Infection occurred immediately after natural or artificial pollination of the flowers, starting from the apex of the pistil and rapidly extending to the ovary, which developed a soft, watery, and repulsively smelling rot. At a later stage the infection spread to the stalks but did not advance more than 2 or 3 cm. down the latter, producing the same rot as in the ovaries. It was noted that only the parenchyma of the affected organs was destroyed, the vascular bundles apparently remaining intact. Isolations showed the constant presence in the diseased tissues of a sporiferous rod, possessing most of the morphological and cultural characters of *Bacillus mesentericus vulgatus* but differing in some minor cultural details, for which reason the author considers it to be a biological strain or race of this organism. Inoculation experiments made in 1925 showed that the organism, although cultured on artificial media for 9 or 10 months, had not lost its pathogenicity in regard to the pistillate flowers of marrows; staminate flowers proved to be almost entirely immune, as only very few were infected and then the symptoms did not go beyond a slight wilting of the flowers. Inoculations of cucumber flowers gave negative results. It is pointed out that all the other parts of the diseased plants, with the exception of the flowers, appeared healthy and vigorous.

The best means of control appears to be the immediate removal and destruction of all infected flowers, as the infection is believed to be spread by various flower-visiting insects.

KUROSAWA (E.). **Studies on Plasmopara cubensis.**—*Journ. Nat. Hist. Soc. Formosa*, xvii, 18 pp., 1927. (Japanese.) [Abs. in *Japanese Journ. of Botany*, iii, 4, pp. (91)–(92), 1927.]

The sporangia of *Plasmopara* [*Pseudoperonospora*] *cubensis*, the well-known parasite of cucumbers, were found to germinate in 1 to

$1\frac{1}{2}$ hours after sowing in drop cultures, rarely after four hours. Each sporangium produces 6 to 8, sometimes as many as 15 biciliate zoospores, measuring 11·5 to 12 by 7 to 7·5 μ; the velocity of their motion is 60 to 80 μ per second and the duration of activity is normally half-an-hour to an hour, but sometimes as long as 24 hours. The zoospores begin to germinate an hour after coming to rest, the germ-tube attaining a length of 50 to 95 μ. The minimum, optimum, and maximum temperatures for germination were found to be 9°, 20° to 22°, and 30° C., respectively. No germination took place in sporangia kept at 37° for twelve hours.

YOKOGI (K.). **On the Hypochnus disease of Soy-beans and its comparison with that of Rice plants.**—*Journ. Plant. Protect.*, xiv, 12 pp., 2 figs., 1927. (Japanese.) [Abs. in *Japanese Journ. of Botany*, iii, 4, pp. (120)–(121), 1927.]

Both *Hypochnus* [*Corticium*] *sasakii* [*R.A.M.*, vii, p. 266] and *H. centrifugus* [*C. centrifugum*] are known to be pathogenic to soy-beans. This observation was confirmed by inoculation experiments. Positive results were also obtained in cross-inoculation tests with *C. sasakii* from rice to soy-beans and vice versa. A comparison between the fungi from both hosts revealed no significant differences and the writer concludes that only one species is involved. The minimum, optimum, and maximum temperatures for the growth of *C. centrifugum* were found to be below 10°, ± 30°, and ± 41° C., respectively, with an optimum for sclerotial formation at 28°.

YOKOGI (K.). **Studies on the Hypochnus disease of Sesamum indicum and the pathogenicity of its causal organsm to Rice plants and Soy-beans.**—*Agric. & Hort.*, ii, pp. 487–500, 1 pl., 2 figs., 1927. (Japanese.) [Abs. in *Japanese Journ. of Botany*, iii, 4, p. (121), 1927.]

Cultural studies on *Hypochnus centrifugus* [*Corticium centrifugum*], the causal organism of the 'white silk disease' of *Sesamum indicum*, showed that the minimum temperature for growth is below 10°, optimum 28° to 32°, and maximum 41° C. [see preceding abstract]. Sclerotial formation is scanty in darkness while the mycelium makes profuse growth under similar conditions. The organism is also pathogenic to rice and soy-beans.

HIRATA (E.). **Studien über die Fäulniskrankheit von Amorphophallus rivieri.** [Studies on the rotting disease of *Amorphophallus rivieri*.]—*Mitt. Landw. Versuchsstat. Tôkyô*, 48, 45 pp., 6 pl., 1927. (Japanese.) [Abs. in *Japanese Journ. of Botany*, iii, 4, p. (79), 1927.]

Amorphophallus rivieri is liable to attack in different parts of Japan from the early summer to September by a rot due to a strain of *Bacillus carotovorus*. A detailed diagnosis of the causal organism, based on cultural and physiological investigations, is given and various control measures are proposed. This strain of *B. caroto-*

vorus can also infect *Arisaema*, *Allium*, radish, *Brassica*, carrot, and potato.

WOODROOF (J. G.). **Okra.**—*Georgia Agric. Exper. Stat. Bull.* 145, pp. 164–185, 8 figs., 1 graph, 1927.

A brief note on the diseases and pests of okra (*Hibiscus esculentus*) mentions two forms of wilt, caused by *Fusarium vasinfectum* and *Verticillium albo-atrum*, respectively. The former is stated to be more important in the southern range of okra cultivation and the latter in the northern. A pod spot [due to *Ascochyta abelmoschi*] may develop after a considerable period in storage (*Journ. Agric. Res.*, xiv, p. 207, 1918).

RAVAZ (L.). **Chronique : Traitement de la chlorose.** [Current events. Treatment for chlorosis.]—*Prog. Agric. et Vitic.*, lxxxviii, 41, pp. 345–347, 1927.

The author states that vines liable to chlorosis should be treated by Rassiguier's method [*R.A.M.*, iv, p. 257] early in October before the leaves have fallen, either by painting the pruning cuts immediately they are made with a 30 to 45 per cent. solution of iron sulphate, according to the maturity of the wood, or by prompt spraying of the whole stocks after pruning. The essential condition of success in either case is the penetration into the cut surfaces of the iron sulphate sufficiently to reach the eyes from which the new shoots will arise. For this reason, long branches should receive treatment over their entire surface.

LEBEDEVA (Mme L. A.). Микофенологические наблюдения на культурах Саратовской Областной Опытной С.-Х. Станции и прилегающих к ней окрестностях летом **1927** года.. [Mycophenological observations made during the summer of 1927 on cultivated plants at the Saratoff Regional Agricultural Experiment Station and in its immediate vicinity.]—*Материалы по Микологии и Фитопатологии* [*Materials for Mycol. and Phytopath.*], Leningrad, vi, 1, pp. 227–238, 1927.

In the first days of June, 1927, sunflower plants on the grounds of the Saratoff Regional Agricultural Experiment Station [southeast Russia] were heavily rusted by *Puccinia helianthi*. Numerous aecidia developed exclusively on the lower side of the cotyledons and of the first three leaves (chiefly on the first leaf), with pycnidia opposite them on the upper side. The disease attained its maximum intensity towards the middle of the same month, when also isolated uredosori began to appear: the formation of uredospores was, however, very slight, owing to the prevailing hot and dry weather.

Dwarf and early maturing varieties were more susceptible than tall and late varieties. An interesting case of segregation was observed in the fifth generation of a cross between a named local variety and the American Burbank sunflower, which hitherto had been considered entirely resistant; of ten lines of the same origin, four gave rise to plants rusted from top to bottom, three to plants rusted chiefly on the lower leaves, and three to plants exhibiting the usual resistance. It was noted that the rust was most severe

on a plot where during the spring the snow had been maintained on the ground by covering the soil with sunflower stalks of the foregoing season, and that infection from that centre chiefly spread in the direction of the winds prevalent in early summer.

Barley in the fields around the Station was severely infected (15 to 20 per cent.) by loose and covered smuts (*Ustilago nuda* and *U. hordei*). Owing to the drought cereals, in general, were but slightly attacked by rusts, with the exception of a variety of wheat known as 'local Poltavka' which was very heavily rusted by *P. triticina* and also proved to be very susceptible to mildew (*Erysiphe graminis*). *P. triticina* was also found on lines of wheat belonging to the sections *alborubrum*, *erythrospermum*, and *lutescens*, while hard wheats, mainly of the sections *hordeiforme* and *melanopus*, were practically free from this rust.

In August an epidemic outbreak of smut (*U. zeae*) was observed on maize in all the fields; the fungus not only attacked all the aerial organs of the hosts, but also formed sori on the roots. The severity of this outbreak is in part attributed to the local custom of dumping infected plants or portions of plants in heaps in close proximity to the fields.

Notes are also given on numerous other diseases of cultivated plants, among which the following may be mentioned. White leaf spot of hemp (*Cannabis sativa*) caused by *Septoria cannabis*; mildew of flax (*Oidium lini*); and a branch parasite (*Dothiorella aceris*) on maples (*Acer tataricum*).

HURST (R. R.). **Report of the Dominion Field Laboratory of Plant Pathology, Charlottetown, P.E.I.**—*Rept. Dominion Botanist for the year 1926, Div. of Botany, Canada Dept. of Agric.*, pp. 24–28, 1927.

In contrast to what was previously reported [*R.A.M.*, vi, p. 208], stem rust of wheat [*Puccinia graminis*] during 1926 caused serious injury (reaching epidemic proportions in September) to the standard varieties in Prince Edward Island, though the crop remained free from rust until late in August. The physiologic forms present were determined as forms 18 and 19 [ibid., ii, p. 158; vi, p. 155], the latter of which had been reported only once previously in Canada. Hard white and red wheats were badly rusted, while of the durum wheats, Kubanka, Arnautka, and Mindum showed 20, 5, and 1 per cent. infection, respectively. The marked scarcity of rust spores caught in spore traps up to late in the season indicates that the island was not infected by wind-borne spores, and as many bushes of *Berberis vulgaris* were found near Charlottetown, some of which bore vigorous aecidia on 15th July, infection is traced to this source.

On 14th June, 1926, heavy infection of blister rust (*Cronartium ribicola*) was found in a clump of *Pinus strobus* at Charlottetown. As the abundance of wild *Ribes* makes eradication impossible, the excellent plantations of five-needle pines in the island are believed to be doomed.

Hollyhock rust [*Puccinia malvacearum*] was so severe that many growers ceased to cultivate this flower. Attempts at control

with Bordeaux mixture 4–4–40 or potassium permanganate (two tablespoonfuls of a saturated solution to one quart of water) completely failed to arrest infection.

HOCKEY (J. F.). **Report of the Dominion Field Laboratory of Plant Pathology, Kentville, N.S.**—*Rept. Dominion Botanist for the year 1926, Div. of Botany, Canada Dept. of Agric.*, pp. 28–36, 1927.

Collections of apple leaves made periodically from 1st April, 1926, at Kentville, Nova Scotia, showed that the asci in overwintered perithecia of *Venturia inaequalis* [*R.A.M.*, vi, p. 209] only began to form about 1st May. On 13th May, after two days' rain, ascospores rapidly developed, and by the middle of the month they were mature, the first discharge occurring on 17th and 18th May. Subsequent discharges continued intermittently until the middle of July. The heaviest discharge was between 14th and 17th June, when many varieties were in full bloom, and some early ones were dropping their petals. After 29th June, ascospore discharge was very slight, and up to the last recorded (15th July) caused no appreciable infection. The first infections were observed on 4th June, a day later than in 1925. As before, unsprayed trees of susceptible varieties yielded approximately 100 per cent. scabby fruit.

At Annapolis Royal, the first ascospore ejection occurred on 25th May, and the next on 2nd June, when the Gravenstein blossoms were showing pink. Heavy discharges before bloom, and during or immediately after full bloom, were observed at Fredericton, Charlottetown, and Kentville.

It is recommended that two pre- and two post-blossom sprays should be given to apple orchards in the Maritime Provinces. Experiments also indicated that a certain measure of control of *V. inaequalis* may be obtained by one application of 2 per cent. copper sulphate to the leaves on the ground, about the time of, and in conjunction with, the regular spraying, and that late infections of the fruit of susceptible varieties are controlled by applying sulphur dust to the trees about 1st September.

Fifty-four and forty-eight varieties and strains of turnip were tested in heavily infected soil for resistance to club-root [*Plasmodiophora brassicae*] at Fredericton and Kentville, respectively. At the former station, in soil with a P_H range of 6·8 to 7·2, only a selection of Herning and the original Studsgaard produced any clean roots. The difference in yield per acre between the highest and lowest yielding plots was 703 lb. At Kentville, 36 varieties were planted in soil with a P_H range of 6·6 to 7·4 (average 7·02). No clean roots were obtained, but the yields per acre were much higher than at Fredericton and most Bangholm strains gave no severely clubbed roots.

The aecidial stage of *Gymnosporangium germinale* was occasionally observed on Gravenstein apples during late summer, but less than one per cent. of any variety was affected.

Stem rot (*Sclerotinia sclerotiorum*) of hemp [*Cannabis sativa*] affected approximately 40 per cent. of the plants in some plots at Kentville.

Racicot (H. N.). **Report of the Dominion Field Laboratory of Plant Pathology, Ste Anne de la Pocatière, P.Q.**—*Rept. Dominion Botanist for the year 1926, Div. of Botany, Canada Dept. of Agric.*, pp. 54–58, 1927.

Notes are given on the prevalence of several of the commoner plant diseases in Quebec during 1926 [cf. *R.A.M.*, vi, p. 210].

The results of three years' tests with inoculated sulphur applied to the soil for the control of potato scab (*Actinomyces scabies*) indicated that, under the conditions at Ste Anne de la Pocatière, the treatment is not efficacious.

At Luceville a demonstration plot planted with mosaic-diseased seed potatoes showed a decrease in the yield per acre of 41·7 per cent. below the control plot.

Of 300 bean plants from seed from plants that had been affected with mosaic for at least three generations, only about six showed mosaic symptoms and they gave the same yield as the healthy plants, probably because of the prevalence of cloudy weather during the growing period.

A service for the inspection and certification of raspberry plantations, the stock in which is grown for sale, against the chief diseases of this crop in Quebec, namely, mosaic and spur blight [*Mycosphaerella rubina*], was inaugurated during the year. The former disease affects chiefly the Newman No. 23 variety and the latter, Herbert, these being the two varieties chiefly grown.

Berkeley (G. H.). **Report of the Dominion Field Laboratory of Plant Pathology, St. Catharines, Ontario.**—*Rept. Dominion Botanist for the year 1926, Div. of Botany, Canada Dept. of Agric.*, pp. 59–102, 4 pl., 1 chart, 1927.

During 1926, two diseases believed to be new to Canada, black heart or *Verticillium* wilt of apricot, and a *Fusicoccum* canker of English walnut [*Juglans regia*], were reported at St. Catharines, Ontario. The *Verticillium* was isolated from discoloured, defoliated branches of apricot, and inoculations with it were successful, the fungus being reisolated from the lesions. The symptoms of the disease and the cultural and morphological characters of the fungus [which are described] agree closely with the descriptions given by Miss Czarnecki of apricot blackheart in California [*R.A.M.*, iii, p. 47]. From the formation of sclerotia the fungus is placed in the *V. dahliae* group.

From the cankered branches of walnut a *Fusarium* and a *Fusicoccum* were isolated, but only the latter proved capable of causing cankers on inoculation, and reisolations gave it in pure culture. It forms clusters of hard, ostiolate, uni- or pluriloculate pycnidia in culture, with hyaline, continuous conidia of two kinds, both in the same cavity: (1) subfusoid, 5 to 8 by 1·5 to 2·5 μ; and (2) long, slender (scolecospores), 10 to 17 by 1 to 1·5 μ.

In an orchard which received the regular lime-sulphur spray schedule for scab [*Venturia inaequalis*], of 2,378 apples, 83·2 per cent. were clean, and less than 1 per cent. severely scabbed. In another orchard where the calyx spray was replaced by one given a week later, and where a sulphur-arsenate dust was applied instead

of the three weeks spray, of 4,632 apples, only 49·4 per cent. were clean, with 4·1 severely scabbed: an equal number of untreated trees giving 1,155 apples, with 15·8 per cent. clean, and 39·7 per cent. severely scabbed.

Isolations from one- and two-year-old peach cankers yielded *Sclerotinia cinerea* in approximately 40 per cent. of the cankers, apothecia of *S. cinerea* also being found in nature towards the end of May on fallen fruits of peach, plum, and (it is believed, for the first time in Canada) on sweet cherry. The conidia averaged 12 by 8·5 μ, those developing from monospore cultures taken from the conidia on the cankers and from ascospores in the apothecia being identical. The cankers were found to originate from the growth of the fungus down into the pedicel and twig or branch on which it was borne, from blossoms affected with the blossom blight form of the disease.

Four out of eight raspberry bushes of the normally resistant Adams 87 variety developed slight mosaic symptoms after aphids (*Amphorophora rubi*) were transferred to them from infected Cuthbert bushes. Natural mosaic infection has not been observed in this variety, while Herbert is also highly resistant in Ontario. Raspberry leaf curl was effectively controlled by roguing.

From numerous experiments [which are described and the results of which are tabulated] the author concluded that streak may be induced in healthy tomato plants by inoculation with healthy or mosaic potato (and occasionally tomato) juice, or with juice from streak-diseased tomato, tobacco, or potato plants, 100 per cent. infection sometimes being obtained. Streak (necrosis) was produced in tobacco by inoculating healthy plants with tomato or tobacco streak, the former inoculum producing streak more often than it produced mosaic. Streak was also produced in tomato when the juice from artificially induced tobacco streak was used as the inoculum. From his experiments, the author considers that the view [ibid., v, p. 636] that a combination of viruses is the cause of tomato streak is incorrect.

In connexion with raspberry wilt (*Verticillium ovatum*) [ibid., v, p. 563] cultural and taxonomic studies of 32 strains of *Verticillium* from Europe and America were carried out, the cultural characteristics on five solid and two liquid media being described, and the factors affecting the production of a black colour in the mycelium or sclerotia discussed. The author considers that, to the two main groups of *Verticillium*, already recognized, namely, the *V. dahliae* group producing black microsclerotia and the *V. albo-atrum* group producing a dark mycelium, a third should be added, consisting of the strains which do not produce a black colour.

SANFORD (G. B.). **Report of the Dominion Field Laboratory of Plant Pathology in co-operation with the University of Saskatchewan, Saskatoon.**—*Rept. Dominion Botanist for the year 1926, Div. of Botany, Canada Dept. of Agric.*, pp. 119–126, 2 figs., 1927.

Very great annual loss is caused by *Ophiobolus cariceti* [*O. graminis*], *Helminthosporium sativum*, *Fusarium culmorum*, and other organisms producing foot and root rots of cereals in western

Canada, where, however, some strains of the Marquis and Early Red Fife wheats appear to show some resistance to *O. graminis*. Laboratory studies indicated that the latter develops better in a 60 per cent. saturated soil at temperatures between 22° and 27° C. than between 12° and 17°. Also, a moisture content of 60 per cent. of the water-holding capacity was more favourable to the disease than one of 40 per cent.

Winter killing of sweet clover (*Melilotus alba*), associated with a fungous disease of the roots, destroyed many hundreds of acres in Alberta and Saskatchewan, though very little loss was noted on the Arctic strain of this crop. The injury may vary from complete killing to deep or slight lesions on the tap roots, which may be wholly or partially rotted, while the lateral roots are often dead.

Field and greenhouse tests of the isolations of *H. sativum* from wheat from different parts of Saskatoon showed a marked difference in the pathogenicity of some of the strains to Marquis and Kubanka wheat. A field experiment to determine the effect of different dates of seeding of Marquis wheat upon infection by *H. sativum* showed little difference in the plots planted on 3rd and 15th May, respectively, but some reduction in injury in that planted on 10th June. The average soil temperature for the period was 10·1°.

EASTHAM (J. W.). **Report of Provincial Plant Pathologist, Vancouver.**—*Twenty-first Ann. Rept. Brit. Columbia Dept. of Agric. for the year 1926*, pp. N 35–N 38, 1927.

Apple scab (*Venturia inaequalis*) was adequately controlled by four applications of Sherwin-Williams's or Hemingway's dry lime-sulphur (4–40 pink, 3–40 calyx and subsequent, or 5–40 pink and $3\frac{3}{4}$–40 calyx and subsequent). The best results, however, were given by commercial liquid lime-sulphur (1–35 pink and 1–40 later), which reduced the incidence of infection from 82·5 to 2·5 per cent. Taking the pink spray as a basis of comparison, the liquid lime-sulphur costs rather less than half the stronger dry mixture.

MCRAE (W.). **Report of the Imperial Mycologist.**—*Sci. Repts. Agric. Res. Inst. Pusa, 1926–27*, pp. 45–55, 1 graph, 1928.

The study of the influence of fertilizers on pigeon pea wilt [*Fusarium vasinfectum*] was continued on the permanent manurial plots at Pusa [*R.A.M.*, vi, p. 207], and, as before, the highest incidence was found in the lots receiving superphosphate, except where a green manure was also added, when the percentage of deaths was somewhat less than in the plot receiving a heavy application of nitrogen in farmyard manure without other fertilizers.

Forty-seven Coimbatore seedling canes, 9 crosses at the Coimbatore Cane Breeding Station, 2 thin, and 38 tropical varieties of sugar-cane are reported to show mosaic infection, in five of the provinces of India. The disease has been found to spread in the field; to be transmissible by setts and by juice injection into the leaves and leaf sheaths; to pass from one cane variety to another, and from cane to maize and sorghum; but the natural insect carrier has not yet been found. The percentage germination in

setts from mosaic canes was lower than that of healthy ones, in an experiment at Pusa, by 13 and 8 per cent. in unirrigated and irrigated land, respectively.

Five out of six setts of Uba cane affected by streak disease [ibid., vi, p. 397] germinated and all the shoots developed the typical streak markings. Experiments in the transmission of the disease gave negative results.

The parasitism of three fungi, namely, a species of *Phytophthora*, *Rhizoctonia* [*Corticium*] *solani*, and *Sclerotium rolfsii* has been definitely established in connexion with the wilt disease of betel pepper (*Piper betle*) in Bengal [ibid., v, pp. 148, 250]. The *Phytophthora* resembles that described by Thompson in Malay and Dastur in the Central Provinces [ibid., v, p. 383; vi, p. 579], and is probably the active agent during the monsoon, *C. solani* being mainly responsible in the cold weather, and *S. rolfsii* during the hot season.

Three of the eight types of gram (*Cicer arietinum*) which did not contract wilt (*Fusarium* sp.) in the previous year's tests became diseased during the current season, so that in two years' trials five out of twenty-five types (15, 16, 21, 23, and 24) have remained immune.

Sixteen types of linseed [*Linum usitatissimum*] tested for their reaction to wilt (*Fusarium lini*) developed varying degrees of infection. So far only one type, from Sabour, has shown a marked degree of resistance.

Repeated attempts to induce germination of the sporangia of *Physoderma zeae-maydis*, which was very prevalent on maize near Pusa during the monsoon of 1926, gave negative results, and inoculation experiments were also unsuccessful. Complete control of *Sclerospora maydis*, which in the previous year attacked 10 per cent. of the maize crop on the Pusa farm, was obtained by twenty minutes' immersion of the seed in 2 per cent. formalin. Roguing also considerably reduced the disease.

Species of *Phytophthora* morphologically resembling *P. parasitica* were isolated from dying cotton seedlings at Pusa, and also from rotting guava fruits. The fungus from the former host infected castor and sesamum seedlings with difficulty, while that from the latter attacked them readily.

Four hundred sporangia of each of the species *P. meadii*, *P. faberi*, and *P. palmivora* [origin not stated], grown on oatmeal agar under the same conditions, were measured. The average dimensions were as follows: *P. meadii* 27 by 20, *P. faberi* 46 by 31, and *P. palmivora* 55 by 33 μ. No oospores were produced in mixed cultures of these species on glucose agar or in liquid media, but under the latter conditions chlamydospores developed in profusion.

Pythium aphanidermatum was found to occur in a parasitic form on chilli seedlings, causing considerable damage.

The roots and shoots of the Manipuri and Gurkhali rice varieties which produced no grain at Tamenglong (Manipur State), were found to be filled with the mycelium of a species of *Fusarium*. The fungus was isolated and inoculation tests with local rice showed it to be capable of killing seedlings and of inducing sterility in the surviving plants. A similar disease has been

observed in two localities of the Punjab and in various villages round Pusa.

The life-history of *Sorosporium paspali* on *Paspalum scrobiculatum* was investigated. The percentage of spore germination was found to increase from 2 per cent. during the first four months to 90 per cent. at nine months. The spores were killed by ten minutes' immersion in 0·1 per cent. copper sulphate, but a 0·5 per cent. solution was necessary to destroy all the spores in a ball; the germination of *Paspalum* seed was not affected by concentrations up to 4 per cent.

HECTOR (G. P.). **Annual Report of the Economic Botanist to the Government of Bengal for the year 1925–26.**—*Ann. Rept. Dept. of Agric. Bengal for the year 1925–26, Appendix* I, pp. i–vi, 1927.

The following references are of interest in the mycological section of this report. Severe attacks of rust and mildew (*Aecidium mori* and *Phyllactinia corylea*) occurred on mulberry plants at the Constantia Sericultural Nursery, Kurseong, subsequent to heavy rain and foggy weather.

Healthy sword-bean plants were destroyed by an attack of *Rhizoctonia destruens* [*Sclerotium rolfsii*].

A serious bacterial disease of cabbage and cauliflower seedlings at Dacca Farm, causing the death of the plants in patches from an attack at the collar, was controlled by spraying the beds with 0·25 per cent. formaldehyde.

Biology.—*Rept. Dept. of Agric. New South Wales for the year ended 30th June, 1926*, pp. 20–21, 1927.

The following are amongst the references of phytopathological interest occurring in this report. The use of early maturing varieties of wheat has greatly minimized the losses from black stem rust (*Puccinia graminis tritici*). Trials of barleys resistant to leaf scald (*Rhynchosporium secalis*) indicated the existence of several types likely to prove satisfactory as fodder.

A serious outbreak of gummosis of sugar-cane (*Bacterium vascularum*) occurred on the Clarence River. Systems of local and district quarantines were devised to combat the disease. Other diseases receiving attention included a bacterial disease of walnuts, brown spot of Emperor mandarins (*Colletotrichum gloeosporioides*), black spot of orange (*Phoma citricarpa*), lemon exanthema, and root rot of fruit trees (*Armillaria*) [*mellea*].

DEIGHTON (F. C.). **Mycological section.**—Issued with *Ann. Rept. Lands and Forests Dept. Sierra Leone for the year 1926*, 2 pp., 1927.

A mosaic disease of cassava, causing mottling and deformation of the leaves, sometimes accompanied by general stunting, was found to be very widespread throughout the country. Near Freetown this disease was also observed on one plant of Ceara rubber (*Manihot glaziovii*).

A disease of the leaves and pseudo-stems of ginger has long been prevalent in the Northern Province. Sclerotia isolated from rotted

pseudo-stems were cultured and found to be almost identical with those of *Rhizoctonia* [*Corticium*] *solani*. This fungus also attacked the leaves of old castor oil plants.

Very severe damage to the groundnut crop was caused by leaf spot (*Cercospora personata*) and rosette or bunching [*R.A.M.*, vii, p. 15].

Rubber trees at Kenema were severely infected by *Ustulina zonata*.

Sisal at Njala was very heavily damaged by a leaf disease apparently identical with the 'sun scorch' reported from East Africa and the Gold Coast. The first symptoms are small, yellowish, raised spots occurring on either side of the leaf and subsequently becoming black and sunken. Large portions of the leaf may be affected, the depressed areas attaining several inches in length and an inch in breadth. The condition is due to sun following heavy rain.

Ring spot of sugar-cane (*Leptosphaeria sacchari*) is common on old leaves but causes little damage.

Anthracnose of mango (*Gloeosporium mangiferae*) is very common, especially during the rainy season [ibid., vii, p. 185].

Plasmopara [*viticola*] occurred in a severe form on vines at Njala but was readily controlled by spraying with Bordeaux mixture. Perithecia of *Uncinula* [*necator*] were found on vine stems.

Angular leaf spot and black arm of cotton (*Bacterium malvacearum*) was very abundant and serious. Cotton leaf roll, a physiological disturbance caused by excess of water [ibid., vi, p. 162], is also prevalent.

A brown leaf spot of coffee caused by a *Cercospora* (probably *C. coffeicola*) is common, especially on *Coffea stenophylla*.

Plant pathology.—*Admin. Rept. Dept. Agric. Trinidad & Tobago for the year 1926*, pp. 35–36, 1927.

Mosaic disease of sugar-cane is most prevalent in the northern part of the Island from San Juan to Arouca, while an eastward extension of infection also occurred during the year notwithstanding energetic control measures.

Little leaf of coco-nuts [*R.A.M.*, iv, p. 464] is still fairly widespread in inland properties.

The leaf disease of coffee caused by *Omphalia flavida* [ibid., v, p. 736] is prevalent in the wetter districts, while considerable damage is done by *Sclerotium coffeicolum* to the Excelsa variety under humid conditions [loc. cit.]. Sporadic outbreaks of thread blight due to *Pellicularia* [*Corticium*] *koleroga* and also of *Rosellinia* root disease have been reported.

On p. 11 it is stated that the progeny resulting from the cross between *Citrus aurantifolia* and the Everglade lime have so far shown no signs of wither-tip (*Gloeosporium limetticolum*) [ibid., vi, p. 479].

Borg (P.). [**Report of the Plant Pathologist.**] **Appendix F.**—*Repts. on the working of Govt. Depts.* [*Malta*] *during the financial year 1925–26*, pp. T 13–T 14, 1927.

Three large consignments of Scotch Champion potatoes imported

from Belfast were heavily infected by corky scab (*Spongospora subterranea*). White Elephant potatoes were severely attacked by blight (*Phytophthora infestans*) in the summer of 1925, and the disease reappeared in the following spring, when it was, however, arrested by timely spraying which has now been generally adopted in Malta.

Heavy losses were incurred in the vineyards of Gozo Island owing to virulent infection by downy mildew (*Plasmopara viticola*). Powdery mildew (*Oidium tuckeri*) [*Uncinula necator*] was more injurious in Malta itself.

MARTIN (W. H.). **Report of the Department of Plant Pathology.** —*Forty-seventh Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1926*, pp. 313–324, 1 graph, 1927. [Received March, 1928.]

This report contains numerous observations on the distribution and prevalence of fungous diseases of plants in New Jersey during 1925–6 [cf. *R.A.M.*, vi, p. 468]. The following, *inter alia*, are of interest. Spraying with Bordeaux mixture against apple blotch (*Phyllosticta solitaria*) gave 86·3 per cent. clean fruit as compared with 11·5 on untreated trees and 48·1 per cent. on those sprayed with lime-sulphur 1 in 40. Blossom-end rot (*Alternaria* sp.) caused very heavy damage (up to 20 per cent. infection), especially on Pippin apples. Superficial bark canker (*Myxosporium corticolum*) was reported on apples from all parts of the State.

Black root of strawberries [cf. ibid., vi, p. 737] was observed in all districts.

Wilt of eggplants (*Verticillium albo-atrum*) was widespread, but the severity of the disease was lessened by ploughing under green manure or applying sulphur. Okra [*Hibiscus esculentus*] was again heavily infected by the same fungus.

Soil rot of sweet potatoes (*Cystospora batata*) [or *Actinomyces pox*: see next abstract] occurred in 80 per cent. of the fields examined, and was particularly virulent where lucerne was included in the rotation and the soil was heavily limed.

Soft rot of tomatoes (*Oospora lactis parasitica*) [ibid., iv, p. 709] was very severe in Burlington County following spray injury.

Root rot of peas (*Aphanomyces euteiches*) was found in 100 per cent. of the plants in some fields. The heaviest damage occurred between 1st and 15th June. Canada field peas proved very susceptible in greenhouse tests and winter vetch [*Vicia villosa*] slightly so. Pea mosaic appears to be increasing annually, up to 60 per cent. infection having been seen. Alaska peas seem to be relatively resistant.

Tipburn of lettuce was responsible for very heavy losses in the southern counties; in one ten-acre field every plant was destroyed.

MANNS (T. F.) & ADAMS (J. F.). **Department of Plant Pathology.** —*Ann. Rept. Delaware Agric. Exper. Stat. for the fiscal year ending June 30, 1927* (*Bull.* 152), pp. 40–51, 2 pl., 1927.

In further inoculation experiments with the species of *Actinomyces* regarded as causing pox of sweet potato [*R.A.M.*, vii, p. 76], typical pox lesions were repeatedly obtained on rootlets and

underground stems of sweet and ordinary potato, beet, and turnip. Evidence was obtained that the fungus produces a very active toxin or enzyme, which destroys the tissues of ordinary and sweet potato. Tests with *A. chromogenus* [*A. scabies*] and *A. poolensis* gave negative results on sweet potato. The optimum temperature for the growth of the pox organism (which the author refers to as *A. pox*) was between 30° and 37° C.; at 52° very slight growth was made. Infection takes place through the rootlets or root tips or in stems through the stomata.

Cowpeas were severely infected with *Cladosporium vignae* which is considered to be as serious a disease as anthracnose of beans [*Colletotrichum lindemuthianum*] and is favoured by similar weather.

Spraying and dusting for the control of bacterial spot of peach and plum [*Bacterium pruni*] gave good results. Conclusive proof was obtained that infection may occur and spread throughout the growing period, and so far has been found always to originate from the overwintered twig lesions.

Investigations on the curculio [*Conotrachelus nenuphar*] as a possible carrier of yellows and little peach proved fruitless, and experiments with other possible vectors are in progress.

Leaf blight of cantaloupes (*Macrosporium cucumerinum*) [ibid., iv, p. 466], favoured by exceptionally heavy rain, was not controlled by three applications of copper-lime arsenate dust containing 10 per cent. copper, but dusts containing 15 and 20 per cent. gave effective control, especially the latter. Hearts of Gold cantaloupes were more resistant than Pollock 1025 to the disease, which appears to be seed-borne. Attempts to determine the source of initial infection of downy mildew of cantaloupes (*Peronoplasmopara* [*Pseudoperonospora*] *cubensis*) gave negative results. The Excel variety showed greater resistance to this disease than Thurmound Grey.

The stunt or dwarf disease of dahlias [ibid., vi, p. 215] does not appear to be transmissible by cuttings but is associated with soil or nutritional factors.

Leefmans (S.). **Ziekten en plagen der cultuurgewassen in Nederlandsch-Indië in 1926.** [Diseases and pests of economic crops in the Dutch East Indies in 1926.]—*Meded. Inst. voor Plantenziekten*, 73, 60 pp., 1927.

This report, prepared on the usual lines [*R.A.M.*, v, p. 652], contains a number of references of phytopathological interest of which the following may be mentioned. Potatoes on the east and west coasts of Sumatra and in Pasoeroean were heavily damaged by rusty spot [ibid., vi, p. 247]. A blue discoloration of the tubers occurred after heavy rains on the west coast of Sumatra. Slime disease (*Bacterium solanacearum*) and mosaic caused serious damage to potatoes in the mountainous regions of south-west Celebes.

Young *Agave* plants were attacked by a species of *Coniothyrium* [cf. ibid., v, p. 302].

Arachis [*hypogaea*] was severely attacked by *Bact. solanacearum* in various districts of the Pekalongan Residency, where infection appears to be on the increase. In the Cheribon uplands, the

losses ranged from 10 to 38 per cent. *Sclerotium rolfsii* caused up to 10 per cent. infection in isolated groundnut fields in the Cheribon and Indramajoe uplands, and may also have been implicated in a root disease observed in one district of the Soerabaja Residency.

Centrosema pubescens was attacked by a species of *Phyllosticta* and by *Rhizoctonia* [*Corticium solani*]. Crops of *Vigna* [*oligosperma*] were entirely devastated by the latter organism [ibid., vi, p. 639], which also occurred on *Tephrosia* [*candida*].

Mouldy rot [*Ceratostomella fimbriata*] was of very general occurrence on *Hevea* rubber in humid areas. The heaviest losses in this crop were again caused by root-destroying organisms, especially the white root fungus [*Fomes lignosus*]. The red root fungus (*Ganoderma pseudoferreum*) was prevalent in West Java, where patch canker (*Phytophthora*) [*faberi*] assumed an epidemic character on certain estates in damp regions. This disease also occurred in a severe form in Besoeki, causing large lesions in the bark. Mildew (*Oidium heveae*) was widespread in West Java, Malang, and Besoeki [ibid., vi, p. 639], but no reduction of yield resulted in the last-named region even in cases of very severe infection. *Helminthosporium heveae* [ibid., iii, p. 300] caused defoliation on an estate in Malang during the west monsoon.

Cinchona in Java was widely attacked by pink disease (*Corticium salmonicolor*) which affected 20 to 40 per cent. of the trees in some plantations. *Armillaria mellea* and *Rosellinia* sp. killed 5 to 10 per cent. of the trees on estates with impermeable subsoil. Other diseases reported on this host were stem rust and canker [ibid., iv, p. 80], the former causing very heavy damage to Ledger seedlings and Succirubra plants in low-lying situations; the grey dadap fungus (*Septobasidium bogoriense*); and *Moniliopsis aderholdi*, the loss from which in some cases amounted to 10 per cent.

Coffee was attacked by black root disease (*Xylaria thwaitesii*) in Malang and by brown root disease (*Fomes lamaoensis*) in Malang and Besoeki, where leaf disease (*Hemileia vastatrix*) was also unusually prevalent in Robusta plantings, probably in consequence of the protracted drought of 1925 and the scarcity of rain during 1926. Downy mildew of maize (*Sclerospora javanica*) was reported from various districts.

As in previous years, nutmeg (*Myristica fragans*) fruits in Central Java were severely injured by an undetermined fungus which reduces the yield to half the normal quantity. The Java vascular disease (*Bact. musae*) [ibid., i, p. 223] was widespread on bananas in Bantam and Batavia, especially on poor soils.

Sereh disease of sugar-cane was extremely prevalent on the susceptible varieties, such as DI 52, SW 3, and 90 F., and it also occurred on EK 28, which shows little external trace of infection. Undoubtedly this disease must be regarded as a contributory cause, accompanying the drought, of the low yield of the year. As usual, mosaic was much more serious in East than in West Java. A rigid system of selection greatly minimizes the loss from this source. The Java gumming disease [leaf scald: *Bacterium* sp.: ibid., vi, p. 121] was less prevalent than in the previous year, as was also root rot, possibly because experience has shown the necessity of

avoiding planting the susceptible EK 28 variety where this disease is liable to occur.

The incidence of slime disease of tobacco (*Bact. solanacearum*) appears to be generally decreasing owing to improved cultural measures and to the abandonment of a number of infected sites. *Phytophthora nicotianae* caused heavy damage in the Deli seed-beds and to field tobacco in Besoeki. Considerable financial loss resulted from this disease in the Kedoe and Benjoemas Residency. Top rot, due to an undetermined cause, was unusually severe on field tobacco on every type of soil.

Diplodia root rot of tea [*Botryodiplodia theobromae*: ibid., ii, p. 343] was reported, for the first time in Java, in the Malanbong district. This fungus was responsible for losses of 10 to 15 per cent. on some estates and destroyed about 80,000 seedlings in one nursery.

BAILEY (D. L.). **Report of the Dominion Rust Research Laboratory, Winnipeg, Man.**—*Rept. Dominion Botanist for the year 1926. Div. of Botany, Canada Dept. of Agric.*, pp. 103–119, 1 pl., 1 fig., 1 map, 1927.

The section [by W. L. Gordon and D. L. Bailey] dealing with oat stem rust (*Puccinia graminis avenae*) states that from 60 collections in various parts of Canada, 33 cultures of form 2, 31 of form 5, 2 of form 1, and 1 of form 3 were differentiated [*R.A.M.*, vi, p. 477]. Physiologic forms much more virulent than the preceding, and to which all varieties of oats appear susceptible, were collected from three widely separated points in Saskatchewan.

Tests made in 1926, at 17 different stations, of 23 varieties of wheat resistant to *P. graminis* showed that Marquillo was almost everywhere the most resistant of the hard red wheats. No significant injury was caused by rust to the wheat at any station west or north of Winnipeg, but eastwards the incidence of rust was so heavy that in many areas the grade of the wheat was lowered. Leaf rust [*P. triticina*] was general.

Epidemiology studies [by J. H. Craigie and F. J. Greaney] showed that during 1926 stem rust of wheat was very light in western Canada, owing probably to small infestation in the spring-wheat area of the United States, the prevalence of a northerly wind during June and the first week of July, and partial drought in many areas. Stationary slide exposures [spore traps] showed that in proportion as a station was situated farther west and north the amount of stem rust inoculum diminished, and its arrival was retarded. Although three uredospores were picked up by aeroplane spore traps at an altitude of 5000 ft. over High River, Alberta, on 31st July, the stationary slides did not reveal any until 24th August; field infections were not found in Alberta until the middle of August, and when these spores were caught primary infections were only beginning to appear in south-eastern Saskatchewan, so that the spores must have come from a considerable distance. On 7th August, an aeroplane exposure 5,000 ft. above Lac du Bonnet, Manitoba, showed a cloud of stem rust and leaf rust spores; the origin of these was uncertain, but during the first week of August harvesting had been in progress near Morden, Manitoba, where

there was a heavy local outbreak of rust, 48,394 rust spores being found there on the stationary slide (area 880 sq. mm.) exposed on 4th August and 49,032 on that exposed three days earlier. The cloud of spores indicated by the exposure over Lac du Bonnet can scarcely have originated farther north than Morden, since rust was rare near Winnipeg and farther north. The patchy nature of rust outbreaks in Canada during 1926 is thought to indicate some relation between these clouds of spores and localized heavy field infections.

Some circumstantial evidence was obtained of infection arising from overwintered uredospores of *P. graminis* in Saskatchewan.

In the section dealing with smut investigations [by I. L. Conners] it is stated that experiments in the control of wheat bunt [*Tilletia tritici*] were continued [ibid., vi, p. 219], successful results being obtained with formalin, corona and mococo (proprietary) brands of copper carbonate, other brands of copper carbonate, and organic mercury compounds [quantities unspecified]. Brands of copper carbonate containing 50 and approximately 20 per cent. of copper were equally effective, and not less so than corona colloidal copper. Du Pont dust no. 12 (an organic mercury compound) gave promising results. Semesan, uspulun, germisan, and tillantin gave about the same degree of control as the copper carbonates. Formalin reduced seed germination in the field by some 20 per cent. but the other substances produced no unfavourable effect, the organic mercury compounds, under greenhouse conditions, stimulating seed germination.

Corona and mococo copper carbonates reduced the amount of covered smut [*Ustilago levis*] in hull-less oats to 2·1 and 0·7 per cent., respectively, from 75 per cent. in the control plots. With sulphur dust also there was only 2 per cent. infection. In common oats only formalin proved effective, the formalin spray (one pint of formalin to one pint of water for 50 bushels of grain) being superior to the dip or sprinkle methods. After spraying, the seed is covered for four or five hours with canvas or bags moistened with ordinary formalin solution.

The experiment begun in 1925 [loc. cit.] to test the varietal resistance of oats to *U. avenae* and *U. levis* was continued with 47 varieties and species. Some varieties of *Avena sativa* that were resistant to *U. levis* proved susceptible to *U. avenae*.

No indications of the existence of biologic forms of *U. levis* were obtained.

STAKMAN (E. C.), KEMPTON (F. E.), & HUTTON (L. D.). **The common Barberry and black stem rust.**—*U.S. Dept. of Agric., Farmers' Bull.* 1544, 28 pp., 11 figs., 3 diags., 1 map, 1927.

This bulletin gives a popular account of the dissemination of stem rust [*Puccinia graminis*] of wheat and other cereals in North America through the agency of the common barberry (*Berberis vulgaris*), of the life-history of the fungus, and of the barberry eradication campaign in the United States.

The uredo stage of *P. graminis* overwinters on cereals and grasses as far south as San Antonio, but seldom as far north as Dallas, Texas, and in some years may be blown into the barberry

eradication area (north-central and mountain States), where, however, it usually arrives too late to do much damage.

Of the two kinds of barberry native to the United States and susceptible to stem rust, *B. canadensis* is found wild in West Virginia and Virginia (where the severe losses for which it has been responsible have led to attempts at eradication), North Carolina, and in a few parts of Indiana, Illinois, and Missouri. *B. fendleri* is found in southern Colorado, but is usually too remote to be of importance.

Mahonia aquifolium is susceptible to stem rust, but *M. repens*, common in the Rocky Mountain region, is immune.

Since the beginning of the barberry eradication campaign in 1918, more than 14,000,000 bushes have been destroyed, many of which, however, sprouted subsequently owing to incomplete eradication. The estimated annual loss of wheat from stem rust in the 13 States concerned in the campaign amounted to 50,419,666 bushels for the period 1915 to 1920, but during 1921 to 1926 the loss dropped to only 15,920,000 bushels.

STRAIB (W.). **Untersuchungen über die Ursache verschiedener Sortenanfälligkeit des Weizens gegen Steinbrand.** [Investigations on the cause of the varying susceptibility of Wheat varieties to bunt.]—*Pflanzenbau*, iv, 9, pp. 129–136, 1 fig., 1 graph, 1927.

Twenty-four out of twenty-six varieties of winter wheat, including some of the best known squarehead types, tested at the Brunswick Botanical Institute for their reaction to bunt [*Tilletia tritici* and *T. levis*], were almost uniformly susceptible in a high degree when artificially contaminated. Only two Nassau varieties, both characterized by a vigorous tillering habit, were approximately half as susceptible as the others.

It was shown in eight summer varieties that the incidence of bunt decreases with the rapidity of growth of the seedling up to the tenth day. Most of the summer varieties were considerably less susceptible to bunt than the winter ones, and the degree of infection in the summer wheats was practically uniform.

The degree of susceptibility to bunt is an inherent varietal character which may, however, be considerably modified by the influence of fluctuating chemical, physical, and climatic factors.

FLORIMOND-DESPREZ. **Carie et poudrage des semences.** [Bunt and the dusting of seed-grain.]—*Journ. d'Agric. Prat.*, xcii, 1, pp. 16–17, 1928.

For four years the writer has successfully used copper oxychloride dust (150 to 200 gm. per 100 kg. of seed-grain) as a substitute for steeping in copper sulphate solution in the control of wheat bunt (*Tilletia caries*) [*T. tritici* and *T. levis*: *R.A.M.*, vi, p. 280]. This preparation is four times as dear as copper sulphate (the above-mentioned quantity costing about fr. 2), but the additional outlay is stated to be well worth while in view of the excellent effects of the dust.

Brunehant. **Le poudrage des semences.** [The dusting of seed-grain.]—*Comptes rendus Acad. d'Agric. de France*, xiii, 34, pp. 1089–1094, 1927.

After a brief reference to the advantages of dusting with copper salts over the liquid treatment of seed-grain for the control of cereal seed-borne diseases [see preceding abstract], the writer describes the construction and application of a special apparatus devised to facilitate the operations and to remedy certain inconveniences attaching to the present methods.

[This paper is reprinted, under the title 'Appareil à poudrer les semences', in *Journ. d'Agric. Prat.*, xcii, 2, pp. 29–30, 1 fig., 1928.]

Benlloch (M.). **La desinfección en seco de la simiente para prevenir la 'caries' o 'tizón' del Trigo.** [Dry seed disinfection for the prevention of 'caries' or bunt of Wheat.]—*Bol. Pat. Veg. y Ent. Agric.*, ii, 5–7, pp. 36–42, 6 figs., 1927.

This is a popular account of recent developments in the practice of dusting wheat seed-grain for the control of bunt (*Tilletia tritici* and *T. levis*). Some observations are made on the advantages of the method and on the technique of its application by means of various apparatus, such as Mayer's Ideal Nos. 1 and 2. The writer has found copper carbonate superior to the ordinary commercial preparations for this purpose, while at the Seed Testing Station at Valladolid neutral copper acetate has also proved effective [cf. *R.A.M.*, vii, p. 26].

Pickling Wheat.—*Journ. Min. Agric.*, xxxiv, 8, p. 691, 1927.

Brief directions are given for the control of wheat bunt [*Tilletia tritici*] by dusting with copper carbonate containing about 50 per cent. copper, and of a fineness such that about 90 per cent. passes through a 200 mesh sieve: 2 oz. of this dust per bushel of seed should be used. Copper carbonate of the quality indicated costs about 75*s.* per cwt., but cheaper forms containing less copper are said to be equally effective if they are as finely ground and used in greater quantities. Wet steeps are indicated if the grain is badly contaminated.

Greaney (F. J.) & Bailey (D. L.). **Studies in cereal diseases. II. Root-rots and foot-rots of Wheat in Manitoba.**—*Canada Dept. of Agric. Bull.* 85, N.S., 32 pp., 8 pl., 4 graphs, 1927.

After briefly reviewing the history of previous investigations of foot rot diseases of cereals in North America, the authors state that numerous isolations from rotted wheat roots collected from ten widely scattered areas of Manitoba showed in almost every case the presence of *Fusarium* (of which there appeared to be at least three distinct types) or of *Helminthosporium sativum*, both of which appear to be more destructive and more prevalent than the take-all fungus, *Ophiobolus cariceti* [*O. graminis*].

Two years' experiments with different rotation series failed to show any conspicuous correlation between these and the severity of infection, nor were root-rotting organisms observed to accumulate in soil cropped continuously to wheat for six years

The only species of *Helminthosporium* isolated was *H. sativum*, but a comparative study [the results of which are tabulated in detail] of four cultures of the fungus revealed at least three strains differing from each other in the morphology of the spores, cultural characteristics, and pathogenicity. Four cultures of *Fusarium* isolated from different wheat roots were tentatively identified as *F. graminearum* (*Gibberella saubinetii*); from their morphological and cultural characters it appeared that each was a distinct strain. No evident correlation was observed between pathogenicity and cultural characteristics in either genus. Greenhouse tests with 28 cultures of *Fusarium* and 16 of *H. sativum* showed marked differences in their pathogenicity, some of the former being exceedingly virulent. Ten cultures of other root-infesting fungi belonging to five widely different genera were either slightly or not at all pathogenic to wheat.

Tests with one of the virulent cultures of *H. sativum* showed that it was also very pathogenic to barley. Similar tests with a virulent *Fusarium* gave negative results. Neither was significantly pathogenic to oats. Two other cultures of *Fusarium* proved moderately and weakly pathogenic, respectively, to wheat, oats, barley, and rye.

Seeds of wheat, oats, and barley treated with semesan and planted in soil inoculated with either *H. sativum* or a virulent culture of *Fusarium* produced more vigorous seedlings than did untreated seed, this effect being most pronounced in barley exposed to *H. sativum*, and lasting until the plants reached maturity.

The remarkably high percentage (60 to 90 per cent. in widely scattered areas) of wheat plants infected with foot- and root-rotting fungi in Manitoba is considered to be extremely significant, and to suggest that a non-virulent type of infection may be permanently present, reducing the vitality of the plant but giving little or no marked symptoms above ground.

Simmonds (P. M.). **Investigations on the foot diseases of cereals in Southern Saskatchewan.**—*Rept. Dominion Botanist for the year 1926, Div. of Botany, Canada Dept. of Agric.*, pp. 126–132, 1927.

During 1926, the growth of the wheat crop was much retarded at places in southern Saskatchewan, apparently as a result of root rot. In some cases a *Pythium*-like fungus was found in the diseased roots and there was also evidence that fungi invading the vessels could cause symptoms resembling root rot. *Fusarium culmorum* and *Helminthosporium sativum* were, however, the root rotting organisms with which the author has chiefly worked [*R.A.M.*, vi, p. 223].

The root rot of oats caused by *F. culmorum* was somewhat more severe in plots sown on 12th June than in those sown during the previous month, probably owing to a sharp rise in the soil temperature after 1st July. All the common varieties of oats were susceptible, though Monarch and Joanette showed some resistance under greenhouse conditions and the former also in the field.

Numerous isolations of *Fusarium* were made from diseased cereals and other plants in Saskatchewan, most of them being of

the *F. culmorum* type. Pathogenicity tests under greenhouse conditions showed that oats and barley were almost always more severely affected than wheat, while in the field oats were again most susceptible, but barley least so.

Seed treatment of oats for the control of *F. culmorum* gave very promising results with semesan, germisan, uspulun, and tillantin; the dusts, segetan, urania, and Dupont 12 were exceptionally good, sulphur and lime gave little, if any, control, and formalin was deleterious.

Russell (R. C.). **Studies in cereal diseases. 'Take-all'.—A destructive disease of Wheat.**—*Canada Dept. of Agric., Pamphlet* 85, N.S., 8 pp., 8 figs., 1 map, 1927.

A brief account is given in popular terms of the take-all disease of wheat (*Ophiobolus graminis*) which appears to be most destructive in western Canada in warm, wet seasons. Losses of 15 to 20 per cent. of the crop have been seen in some fields. Crop rotation is considered to be the most promising means of control.

Pietin o mal del pie de los cereales. [Piétin or foot rot of cereals].—*Min. Agric. Nac. (Buenos Aires) Secc. Prop. e Inform. Circ.* 731, 3 pp., 1 fig., 1927.

A brief, popular description is given of the symptoms and effects of foot rot (*Ophiobolus graminis*), which attacks wheat, barley, rye, and various wild grasses in the cereal-growing districts of the Argentine (south of Córdoba and Santa Fé and north of Buenos Aires, La Pampa, etc.). In addition to cultural measures for the control of this disease, the application of a 15 per cent. solution of sulphuric acid (1,000 l. per hect.) is recommended [*R.A.M.*, vi, p. 280].

'Brown neck' in Wheat.—*Journ. Min. Agric.*, xxxiv, 8, p. 693, 1 pl., 1927.

This article contains the following additional information about the brown discoloration of the wheat haulm recently described by Biffen [*R.A.M.*, vi, p. 596] and here designated 'brown neck': the stain, which becomes more marked as the haulm ripens, is mainly due to the death from some obscure cause of groups of cells near the surface of the haulm. There is no interference with the sap-conducting channels, and the straw does not break at the neck, so that no apparent harm to the crop results. The condition is not confined to any one variety, and has been known for many years, but appears to have become more common recently.

Waterhouse (W. L.). **Studies in the inheritance of resistance to leaf rust, Puccinia anomala Rostr., in crosses of Barley.**—*Journ. & Proc. Roy. Soc. New South Wales*, lxi, pp. 218–247, 2 pl., 1927.

Glasshouse tests were made with 117 varieties of barley, belonging to six species, to determine their reaction to one Australian physiological form of leaf rust (*Puccinia anomala*) [*P. simplex*] collected at the Werribee Research Station, Victoria. Fifteen varieties of *Hordeum vulgare*, including three strains of Minnesota

(Smooth Awn × Manchuria) and four selections of Manchuria, and one variety of *H. distichon* (*H. d. rimpaui typica*) proved highly resistant, but none of these is entirely suitable for extended cultivation under New South Wales conditions.

In 1923 and the following years a number of crosses were made at Sydney between susceptible commercial varieties, e. g., Cape, Skinless, and Kinver, and certain of the above-mentioned resistant varieties. These crosses were tested in the F_1, F_2, and F_3 generations. The results showed clearly that the inheritance of resistance to leaf rust is dependent on a single dominant genetic factor. Complete dominance was shown in the F_1 individuals, while in the F_2 generation segregation occurred in a ratio of three resistant plants to one susceptible. The F_3 generation studies confirmed the hypothesis that a single dominant genetic factor underlies resistance. These results are compared with those obtained by Mains and Leighty in their investigations on the resistance of rye and wheat to leaf rust (*P. dispersa* and *P. triticina*, respectively) [*R.A.M.*, iii, p. 268; v, p. 725]. Preliminary observations showed no indication of a correlation between rust resistance and morphological characters. Tests of seven selections of Minnesota and Manchuria barley indicated a general correlation between resistance to *Helminthosporium sativum* [ibid., iii, p. 643] and resistance to leaf rust.

PARSON (H. E.). **Physiologic specialization in Puccinia coronata avenae.**—*Phytopath.*, xvii, 11, pp. 783–790, 1927.

Twenty-seven varieties, selections, and species of cultivated and wild oats were inoculated with collections of crown rust (*Puccinia coronata avenae*) [*P. lolii*] from fifteen different localities in the United States and Canada. Four varieties, *Avena sterilis nigra*, Red Rustproof C.I. 1815, Ruakura C.I. 2025, and Green Mountain proved to be differential hosts. On the basis of the reaction of these varieties to the different collections of rust, it was possible to distinguish four (possibly five) different biologic forms. These forms produce varying effects [which are briefly described] on the inoculated plants. In some cases the effect on a single host determines the identity of the form. The forms also appear to differ in their readiness to produce teleutospores, this process being apparently independent of the varietal reaction of the host, and due rather to an inherent tendency within the strains. The physiological specialization of the pathogen must be considered in the development of varieties of oats resistant to crown rust.

ALBERTS (H. W.). **Effect of pericarp injury on moisture absorption, fungus attack, and vitality of Corn.**—*Journ. Amer. Soc. Agron.*, xix, 11, pp. 1021–1030, 2 figs., 1927.

The pericarp of maize kernels is frequently injured by bruising, by the gnawing of mice, or by shelling. This results in the exposure of the endosperm to atmospheric fluctuations of moisture, and in the diffusion through the endosperm of the enzymes secreted by the epithelial cells of the scutellum: the products of this enzymatic activity readily become available to saprophytic fungi which invade the disorganized tissues. Such organisms utilize the hydro-

lysed starch for their metabolism and secrete enzymes which cause a rapid decomposition of the endosperm. The growth of seedlings weakened by these factors is slow and the mesocotyl is subject to attack by facultative parasitic fungi which further arrest the development of the seedling.

IKATA (S.). **Studies on the causal organism of the Citrus scab.**—Reprinted from *Studia Citrologica*, i, 2, 22 pp., 2 pl., 1927. [Japanese, with English summary.]

This paper (originally written in 1909, but the publication of which was delayed) states that the causal organism of citrus scab [*R.A.M.*, iv, p. 476] isolated from diseased lemon and Satsuma orange fruits from Miyazaki, when grown in culture (it developed best on koji agar), produced sporodochia, conidiophores, and hyaline conidia easily germinating in water, and forming characteristic, yeast-like hyphae. Identified as a *Sphacelia* and named *S. citri* n.sp., it is stated to be clearly the same as Fawcett's *Cladosporium citri* but quite different from the organism described by Massee under this name. Inoculations gave positive results on lemon leaves and also on fruits of Satsuma orange and grapefruit. Old tissues of the host are not affected, only the very fleshy growth being severely attacked. The earlier infection occurs, the greater is the protrusion of the area attacked. The incubation period of *S. citri* is between three and ten days. On fresh material the conidia are found with difficulty, but they are easily detected after rain or on keeping the material for a day or two in a moist chamber. The stromatic tissue of the sporodochia consists of coloured cells, 10 to 20 by 5 to 10 μ, with apiculate, uniseptate conidiophores, 6 to 13 by 3·5 μ. The conidia are borne singly and are ellipsoid or ovoid, rarely orbicular, with 1 or 2 oil drops, and 4 to 6 by 2·5 to 5 μ in diameter.

FAWCETT (H. S.) & BARGER (W. R.). **Relation of temperature to growth of Penicillium italicum and P. digitatum and to Citrus fruit decay produced by these fungi.**—*Journ. Agric. Res.*, xxxv, 10, pp. 925–931, 3 graphs, 1927.

This paper is an amplified account of the work, of which an abstract has been already noticed from another source [*R.A.M.*, vii, p. 238].

SAHASRABUDDHE (D. L.). **A remedy for a die-back disease of Orange plants.**—*Agric. Journ. of India*, xxii, 6, pp. 460–461, 1927.

A great improvement in the condition of orange trees suffering from die-back at Deolali in the Ahmednagar District of Bombay Presidency has been effected by digging trenches and filling them with stones, bricks, and plant refuse to promote aeration of the roots [*R.A.M.*, vi, p. 549]. The number of fruits per hundred plants in the treated plots was 15,789 compared with only 595 in the untreated. Preliminary experiments on similar lines at Vadala have given promising results.

Venkatarayan (S. V.). **Costs of spraying.**—*Planters' Chron.*, xxii, 47, pp. 718–720, 1927.

In the writer's opinion, the estimates recently quoted for the cost of spraying against black rot of coffee [*Corticium koleroga*] are altogether too high [*R.A.M.*, vi, p. 724]. In the first place, certain items, e. g., the provision of tubs and barrels and the cost of the necessary European supervision should be debited to the general management of the estate. Secondly, the quantity of mixture recommended (400 to 450 galls. per acre of 1,200 trees) is excessive, 175 galls. for pruned and 300 galls. for unpruned coffee having been found sufficient in the experiments of the Mysore Agricultural Department. According to the writer's estimate, the total cost of spraying one acre of 1,200 trees (using lime-casein as an adhesive instead of the more expensive resin soda) is Rs. 21–8–0 [about £1 12*s.* 0*d.*]. Calculating an increased return of 50 to 65 per cent. from spraying, and taking the average yield of coffee to be 5 cwt. per acre, the gain from the treatment may be estimated at 2·5 cwt. per acre, or Rs. 175 [£13 2*s.* 6*d.*] at Rs. 70 [£5 5*s.* 0*d.*] per cwt.

Lewin (C. J.). **On the incidence of leaf curl of Cotton in Southern Nigeria.**—*Sixth Ann. Bull. Agric. Dept. Nigeria*, pp. 70–77, 1 graph, 1927.

The figures obtained in a recent comparative survey in Nigeria of the incidence of leaf curl on various types of cotton [*R.A.M.*, vi, p. 161] indicate that the Ishan variety (*Gossypium vitifolium*) is slightly more susceptible than Meko (*G. peruvianum*).

The results of a preliminary investigation showed that the disease causes a reduction in the size of bolls due to a diminution in the number of seeds per boll. The possibility that fertilization may be inhibited to some extent is suggested.

The occurrence of a certain degree of resistance to leaf curl in individual plants of both the above-mentioned varieties suggests that resistance to this disease may be hereditary and possibly correlated with some morphological character, such as pubescence. Two highly resistant strains of Ishan have been isolated. Even highly resistant plants, however, appear to become susceptible to leaf curl during the early rains.

Golding (F. D.), Lean (O. B.), & Laycock (T.). **A critical comparison of the factors inhibiting the development of three species of Cotton in Southern Nigeria.**—*Sixth Ann. Bull. Agric. Dept. Nigeria*, pp. 5–69, 4 graphs, 1927.

The main object of the writers' experiments, carried out at Ibadan and Adio, Nigeria, during the period 1925 to 1927, was to study the insect and fungous factors affecting three species of cotton, viz., American Allen (*Gossypium hirsutum*), native Ishan (*G. vitifolium*), and native Meko (*G. peruvianum*) grown in the two different localities.

From the three assessments made by various investigators at Moor Plantation, Ibadan (1923, 1924, and 1925), it would appear that angular leaf spot *Pseudomonas* [*Bacterium*] *malvacearum* is not so destructive a factor in the cotton crop of the Oyo Province

as was previously believed [*R.A.M.*, vi, p. 228]. The complete immunity from this disease of the American variety in 1924 and 1925 was very remarkable, while the small amount of damage to the native varieties during these seasons was in marked contrast to the high incidence of infection in 1923. From preliminary data it would seem that when the cotton was sown in July there was considerably less loss from this source.

The *Alternaria* fungus, which produces circular, zonate lesions [loc. cit.], was found to be a more important cause of defoliation than *Bact. malvacearum*. While the proportion of buds shed owing to bollworm injury was much greater on the Allen than on the native plots, the reverse was true of the proportion of *Alternaria* and bacterial shedding. Both these diseases are considered to be potent factors in the causation of abscission; in very few cases did bolls attacked by either source of infection in the early stages of development remain on the plants. The lesion caused by *Alternaria* is usually situated in the glandular area at the base of the boll between the bracts, but in some of the shed bolls there was an elliptical zone of infection on the pedicel immediately behind the boll. This particular type of lesion was found on 15·6 per cent. of the shed bolls of the Ishan variety at Adio. Generally speaking, it would seem that *Bact. malvacearum* is the more important cause of boll shedding in open country, and *Alternaria* in the more humid forest zone.

In an estimate of the amount of damage caused by *Bact. malvacearum* it was found that 24·2 per cent. of the bolls with infected pericarps subsequently showed no damage on their locks, implying that the injury was only superficial. It was also observed that many bolls with locks damaged by bacteria had no lesions from this source on the pericarps.

It has been ascertained that bolls infected in the early stages by *Nematospora gossypii* [ibid., vii, p. 94] are usually shed, and therefore internal boll disease may be considered as a cause of abscission, in Allen cotton. The figures obtained in these tests indicate that bolls escaping injury from this source during development have every prospect of producing good lint even if severely damaged in their later stages.

FAHMY (T.). **The Fusarium disease (wilt) of Cotton and its control.**—*Phytopath.*, xvii, 11, pp. 749–767, 8 figs., 1927.

A survey made during 1924 and 1925 showed that the *Fusarium* wilt of cotton [*R.A.M.*, vi, p. 725] was so destructive in parts of Lower Egypt as to necessitate the substitution of the resistant but less profitable short-staple varieties, Ashmouni and Zagora, for the highly susceptible long-staple Sakel.

The most characteristic feature of the disorder in Egypt is a yellowish network, resembling mosaic, on the leaves, the affected parts of which may eventually dry up and turn light brown. This symptom occurs more frequently in seedlings than in adult plants and appears when there is abundant soil moisture. The stems of diseased plants may die from the growing point downwards. The whole plant may be killed, or it may survive by the production of new shoots from the lower portion of the stem. Such recovered

plants may later be dwarfed, with much basal branching and poor productive capacity.

The characters of the fungus in the tissues and in culture are fully described. The optimum temperature for growth was 30° to 35° C. [ibid., vii, p. 227, and next abstract]. The incubation period was found to vary with the average day temperature. Mosaic symptoms appeared on Sakel cotton after 12 days at 26·9°, 14 days between 23·7° and 26·1°, 22 days at 20·6°, and 58 days at 15·9°. Under field conditions the first symptoms appear 60 to 90 days after the cotton is sown in March.

In a test of varietal susceptibility, Garofalou was almost as heavily infected as Sakel (92 and 96 per cent., respectively); 310, Assili, and Nahda showed 73, 54, and 50 per cent. infection, respectively; Toudri, Pilion, and Fathi were comparatively resistant (16, 13, and 6 per cent., respectively), and Ashmouni and Zagora immune.

During the warmer season the fungus produces a brick-red zone at the hypocotyl of infected seedlings. The plants are girdled at this point and gradually collapse.

The disease occurs most commonly in heavy, fertile soils, especially where organic manure is applied, in contrast to the disease in America where it is prevalent on light soils. The fungus has been found at a depth of 1 m. or more below the surface, but infection is most severe in the first 40 cm. A rotation experiment begun in 1922 showed that up to 1926 the severity of the disease increased with the frequency of cropping with susceptible varieties. On six plots planted each year with Sakel cotton the average percentage of infection in 1926 was 74·5, the corresponding figures for planting in alternate years being 25 and 33, and in every third year 10 and 23 per cent., respectively, in two different series of plots.

A comparative study was made of the species of *Fusarium* causing cotton wilt in Egypt, India, and the United States, respectively. The chlamydospores of the Egyptian fungus tend to become smaller towards one or both extremities of the chain in which they are borne; they are frequently dumb-bell shaped. The basal cell of the uniseptate terminal chlamydospore of the Indian species is rectangular and definitely constricted at the middle. The hyphae of the American fungus contain spherical to globose, non-septate, intercalary chlamydospores, which vary in size in some of the chains, giving a peculiar knotted appearance. The substratum coloration of the Egyptian *Fusarium* (brilliant yellow with light cobalt violet on rice and different shades of mauve on oatmeal agar) differs considerably from that of the Indian and American forms. The Egyptian *Fusarium* was found to be capable of attacking some of the Indian varieties, while the pathogenicity of the Indian and American forms was practically restricted to the varieties of their respective countries of origin. These differences are thought to justify the establishment of a new variety of *F. vasinfectum*, var. *egyptiacum*, for the Egyptian fungus.

Bare fallow and disinfection with carbon bisulphide having proved ineffective in the control of the *Fusarium* disease, four wilt-resistant strains of Sakel have been obtained by selection and are being grown in heavily infected soil at Giza. It is hoped that

by this means a continuous supply of resistant seed will gradually become available to growers.

NEAL (D. C.). **Cotton wilt: a pathological and physiological investigation.**—*Ann. Missouri Bot. Gard.*, xiv, 4, pp. 359–407, 8 pl., 2 graphs, 1927.

A full description of cotton wilt (*Fusarium vasinfectum*) [see preceding abstract] is given, with a review of the literature on this subject. The disease is said to cause an average annual loss to the United States cotton crop of over 350,000 bales.

Studies have been made on the growth-temperature and hydrogen-ion relations of the fungus in pure culture and on the factors involved in the development of wilt. *F. vasinfectum* grows slowly at temperatures below 10° C., the optimum temperature for development being 28° to 30° and the maximum about 38°. Good growth was made over a range of hydrogen-ion concentrations from P_H 3·0 to 5·5, with a maximum in cultures started at P_H 3·5. The fungus tolerates strongly acid and alkaline (P_H 9) culture solutions. Modifications in the reaction of the culture solution occurred during growth. Cultures originally acid became less so, while those originally alkaline became slightly acid, except the ones started on the extreme alkaline side. Both filtrates and extracts of the mycelial mat of the fungus were found to possess toxic properties [*R.A.M.*, vi, p. 291]: these were not destroyed by boiling but their toxicity was reduced by the dilution of the filtrate.

Quantitative analyses for iron oxide in the tissues of mature healthy and diseased cotton plants revealed no correlation between iron accumulation and wilt infection, though pot experiments indicated that an excess of iron in the nutrient supplied favoured wilt. The toxicity of aluminium salts to cotton seedlings is not pronounced, and plants grown in nutrient solutions containing varying quantities of these salts were no more susceptible to infection by *F. vasinfectum* than those cultivated without them [cf. ibid., vi, p. 226].

No consistent increase or reduction of infection by nutritional treatment was observed in the greenhouse experiments. Both greenhouse and field experiments indicated that fertilization with potassium salts may delay infection by *F. vasinfectum* and thus enable the plants to mature a portion of their bolls, especially where consistent crop rotation is practised to maintain the organic content of the soil.

Tests of wilt resistance have been carried on for a number of years at the Mississippi Agricultural Experiment Station. In 1926 the most promising long staple varieties were found to be Lightning Express, Watson, and Super Seven, while among the short staples Rhyne's Cook, Dixie Triumph, Cleveland 54, and Solomon's and Oates's Big Boll gave encouraging results.

GARBOWSKI (L.). **Spostrzeżenia nad owadomórkami. 1. Empusa aulicae Reich. w związku z kleską sówki chojnówki, Panolis flammea Schiff. w lasach Wielkoposki i Pomorza w r. 1923/24.** [Notes on insectivorous fungi. 1. *Empusa aulicae* Reich. in relation to the damage caused by the caterpillar of *Panolis*

flammea Schiff. in the forests of Posnania and Pomerania in the years 1923–24.]—*Prace Wydz. Chorób Roślin Państw. Inst. Nauk.-Rolniczego w Bydgoszczy, 1927* [*Trans. Phytopath. Sect. State Inst. Agric. Sci. in Bydgoszcz, 1927*], 4, pp. 1–24, 24 figs., 5 maps, 1927. [French summary.]

A brief account is given of the damage done by caterpillars of *Panolis flammea* to the forests of Posnania and Pomerania in Poland during the epidemic invasion of this insect which lasted from 1922 to 1924. The total area affected in these two provinces amounted to about 150,000 hect., out of which over 56,000 hect. had to be cleared out in consequence of the attack. As in previous invasions, however, the caterpillars were rapidly destroyed in June–July, 1924, by a fungous disease which killed them in such numbers that towards the end of July not a single living individual was to be found, nor did they reappear in the following years.

Investigations showed that over the whole invaded area the total disappearance of *P. flammea* was chiefly due to *Empusa aulicae.* Although some correspondents also mentioned a species of *Entomophthora* and a species of *Botrytis,* all the numerous samples of dead caterpillars examined by the author had been killed by *E. aulicae.* The majority of these specimens consisted of caterpillar mummies entirely filled with the mycelium of the fungus and covered with a layer of ovate-pyriform, hyaline conidia, averaging 28 by 18 μ in diameter. A certain proportion, however, were filled with a mass of resting spores of the fungus, without any trace of mycelium. When mature the resting spores were globular, of a dark brown colour, and from 30 to 45 μ (most frequently 37 μ) in diameter.

The conidia germinated freely in a number of media, but all attempts to germinate the resting spores in 1925, as well as in the two following years after they had been subjected to the action of winter cold, gave negative results. Attempts to infect (in the absence of living specimens of *P. flammea*) caterpillars of *Pieris brassicae, Malacosoma neustria,* and *Lymantria* [*Porthetria*] *dispar* with the resting spores of the fungus also failed.

GARBOWSKI (L.). **Spostrzeżenia nad owadomórkami. 2. Entomophthora (Tarichium) punctata n. sp. na Phytonomus variabilis Hbst. i Entomophthora sphaerosperma Fresen. na Pieris brassicae L.** [Notes on insectivorous fungi. 2. *Entomophthora* (*Tarichium*) *punctata* n. sp. on *Phytonomus variabilis* Hbst., and *Entomophthora sphaerosperma* Fresen. on *Pieris brassicae* L.]—*Prace Wydz. Chorób Roślin Państw. Inst. Nauk.-Rolniczego w Bydgoszczy, 1927* [*Trans. Phytopath. Sect. State Inst. Agric. Sci. in Bydgoszcz, 1927*], 4, pp. 25–31, 5 figs., 1927. [French summary.]

A brief account is given of a fungus which, in 1924, was found killing the larvae of the lucerne weevil *Phytonomus* [*Hypera*] *variabilis* in a district of Posnania [Poland]. In its general characters and the symptoms caused by it, the fungus is closely related to *Empusa phytonomi* (later identified by Lakon with *Entomophthora sphaerosperma*) recorded in the United States, but it

differs from the latter in the fact that it does not form conidia and that its resting spores are somewhat larger; further, the resting spores were of a smoky colour and their walls were densely, if irregularly, covered with small dots, while those of *E. sphaerosperma* are hyaline to yellowish, and their walls are smooth. For these reasons, the author regards his fungus as a new species which he names *E.* (*Tarichium*) *punctata*, a Latin diagnosis being given.

Studies of the germination of conidia of *E. sphaerosperma*. collected in the autumn of 1926 from mummies of caterpillars of *Pieris brassicae*, showed that the conidia formed earlier in the season germinated much more freely than later ones, the germination of which usually gave rise to degenerative forms. All attempts to germinate the resting spores of the fungus, either the same year, or in 1927 after the spores had been subjected to winter frosts, gave negative results.

KEILIN (D.). **On Coelomyces stegomyiae and Zografia notonectae, fungi parasitic in insects.**—*Parasitology*, xix, 4, pp. 365–367, 1927.

Under the name of *Zografia notonectae* n. g., n. sp., Bogoyavlensky described a new organism which he found parasitic in the body cavity of *Notonecta* (Hemiptera) collected in ponds in the government of Moscow (*Arch. Russian Protistol. Soc.*, i, p. 113, 1922).

The parasite, which was found from the end of May until September, attacked the host at all stages of development. In the early stages, the fungus is composed of a branched plasmodium giving off numerous filaments which form a mycelium with anastomosing lateral branches. The mycelium is always found lying free between the lobes of the fat body and never penetrates inside the cells of this tissue. In advanced stages of the host, the mycelial branches form terminal swellings, which increase in size and become detached as oval, plurinuclear bodies. These become surrounded by a membrane, which is at first hyaline and transparent but soon thickens and turns yellowish or brown. The numerous nuclei migrate towards the periphery, and in a few cases condensation of the protoplasm round them resulted in the disintegration of the whole of the contents into a number of small, amoeboid, uninuclear bodies.

The author briefly recapitulates his observations on *Coelomyces stegomyiae* [*R.A.M.*, i, p. 70] and concludes, from a comparison of the diagnosis and figures with those of Bogoyavlensky, that the organisms involved are either identical or very closely related. In *C. stegomyiae*, however, the sporangial wall is composed of two distinct membranes, while in *Z. notonectae* only a single, thick, uniform, and structureless envelope is shown. The slight differences are not regarded as having generic value, and as *Coelomyces* has priority, the organism above described is renamed *C. notonectae.*

The systematic position of *Coelomyces* still remains uncertain. Bogoyavlensky placed his species near *Sporomyxa scauri* Léger (*Arch. für Protistenkunde*, xii, p. 109, 1908), parasitic in the fat body of a beetle, *Scaurus testis*. The present writer, however, considers the resemblance between these two parasites very superficial,

and sees in the sporangial development of *Coelomyces* a closer affinity with *Mycetosporidium talpae* Léger and Hesse (*C. R. Soc. Biol.*, lvii, p. 92, 1905) than with any other Mycetozoon. *Coelomyces* further shows several characters in common with the Chytridiaceae, especially the genera *Physoderma* and *Catenaria*.

FEYTAUD (J.) & DIEUZEIDE (R.). **Sur un champignon parasite du Reticulitermes lucifugus Rossi.** [A fungus parasitic on *Reticulitermes lucifugus* Rossi.]—*Comptes rendus Acad. des Sciences*, clxxxv, 14, pp. 671–672, 1927.

Termites (*Reticulitermes lucifugus*) in the region of Bordeaux have been observed since 1922 to be occasionally attacked by a fungous disease, characterized by the appearance, at any point on the body or the limbs of the insects, of small, round or oblong, greyish disks with black margins. Under the microscope the surface of these disks appears as a network with polygonal meshes, corresponding to the extremity of erect sporogenous hyphae, while the bottom of the meshes is constituted by pear-shaped, thick-walled cells disposed in radiating chains, which are believed to be chlamydospores. The black margins consist of sterile hyphae. The whole disk is fixed by a pedicel which penetrates through the chitin layer and hypoderm into the deeper tissues, which are destroyed within the network formed by the penetrating hyphae. The fungus was never observed to affect the digestive tract or the nervous system of the insects, the normal activity of which does not appear to be impaired by the disease unless it breaks out on the limbs. The disease is contagious, since it is always present in some colonies and not in others, but its incidence was never found to be higher than 0·5 per cent.

The causal fungus is stated to be closely related to *Termitaria snyderi* described by Thaxter on *Reticulitermes* sp. in the United States (*Bot. Gaz.*, lxix, 1, 1920), but differs from it in its prismatic spores, pear-shaped chlamydospores disposed in radiating chains, and in the absence of setae traversing the hymenium.

BOLOGNESI (G.) & CHIURCO (G. A.). **Le micosi chirurgiche.** [Surgical mycoses.]—vii + 1032 pp., 558 figs., Siena, Libreria Editrice Senese, 1927.

This, the second volume of the series of text-books on human mycoses under the general direction of Professor G. Pollacci [*R.A.M.*, vi, p. 483], deals with those diseases of man caused by fungi, which call for more or less extensive surgical intervention. Primarily the diseases are divided into the following groups. 1. Well-determined mycoses. 2. Undetermined mycoses. 3. Mixed mycoses or polymycoses. 4. Dubious mycoses, i. e., diseases presenting clinical symptoms similar to those caused by fungi, but in which no fungus can be isolated in culture. 5. Pseudomycoses, among which are included botryomycoses, the etiology of which is not yet fully established, and staphylomycoses, the clinical evolution of which presents characters disagreeing with those of other diseases caused by bacteria.

Well determined mycoses [which are stated to form the principal theme of the book] are separated into four main groups: those

caused by Phycomycetes, by Protoascales, by Mucedineae, and by Dematieae. In describing the diseases, notes are given on their etiology with particular reference to the parasitic or saprophytic characters of the causal organisms; the morphological and cultural characters of the latter; their polymorphism; the toxins produced by them, if any; the clinical aspects of the diseases; and their geographical distribution. Each chapter is followed by a copious bibliography. Many of the figures that illustrate the book are original.

Actinomycosis in Bessarabia.—*The Lancet*, ccxiii, 5444, p. 1409. 1927.

The district medical officer at Czernowitz [Bukovina] has investigated seven cases of human actinomycosis near the Bessarabian border. Nearly all were infected on the face and neck, and in each case the clinical diagnosis was confirmed by microscopic examination of the pus. With the addition of three other cases observed at Chisinew, the total number reported from mid-eastern Europe is 46. In 24 of these, infection was restricted to the face and neck, while in the remainder the viscera were attacked. From a study of the literature on 250 cases it is deduced that the cutaneous forms cause death only in 2 to 3 per cent., the corresponding figures for cervico-facial, temporo-maxillary, and submaxillary infections being 10, 30, and 50 per cent., respectively. The death-rate in abdominal actinomycosis of intestinal origin is estimated at 65 per cent., while only about 15 per cent. of the patients recover when the liver or cerebrospinal system is attacked.

Reina Guerra (A.). **Mycétome actinomycosique à grains jaunes à San Salvador.** [Actinomycotic mycetoma with yellow grains in San Salvador.]—*Ann. de Parasitol. Humaine et Comp.*, v, 4, pp. 344–355, 13 figs., 1927.

The pus from a mycetoma on the foot of a man in San Salvador was found to contain numerous yellow grains from 50 to 200 μ in diameter, composed of very slender (0·5 μ in diameter), homogeneous, continuous, hyaline hyphae without club-shaped bodies or spores. In pure culture on a special medium [the composition of which is given] a slender, hyaline, continuous mycelium developed, the free ends of the hyphae being swollen. The mycelium easily breaks up into bacilliform fragments from 3 to 7 μ in length. The morphological characters of this fungus are compared in a table with those of the genera *Cohnistreptothrix* and *Actinomyces*, but it is not named.

Hare (J. G.) & Tate (P.). **On the fungi causing ringworm in children attending London County Council schools.**—*Journ. of Hygiene*, xxvii, 1, pp. 32–36, 1927.

Cultures were obtained from 69 cases of ringworm of children attending London County Council Schools. Three of these were cases of favus due to *Achorion schönleini*, but the majority of infections (78 per cent.) were caused by species of *Microsporon*. *M. audouini* was found in 70 per cent. of these cases, *M. lanosum* and *M. felineum* in one case each, and three unidentified species of the

same genus in four other cultures. Endothrix *Trichophyton* species were found in 17 per cent. of the cases and included *T. crateriforme*, *T. sulfureum*, *T. acuminatum*, and *T. violaceum*, named in order of frequency. The equivalent names of these fungi in Ota's and Langeron's system of nomenclature are also given. It is concluded that animal infection is a negligible factor in the causation of ringworm among London school children.

SMITH (E. C.). **Dermal moniliases among natives of West Africa.**—*Trans. Roy. Soc. Trop. Med. & Hygiene*, xxi, 2, pp. 125–130, 8 pl., 1927.

Many mycotic affections superficially resembling ringworm have been found, on examination at the African Hospital, Lagos, Nigeria, to belong to another type of mycosis, namely, that induced by a species of *Monilia* allied to *M.* [? *Candida*] *pinoyi* [*R.A.M.*, vii, p. 167]. Details are given of the clinical symptoms associated with the condition, which in Europeans may assume the form of 'prickly heat' [ibid., vi, p. 292], and various diagnostic criteria—microscopic, cultural, and histological—are discussed.

ACTON (H. W.) & PANJA (G.). **Seborrhoeic dermatitis or pityriasis capitis: a lesion caused by the Malassezia ovale.**—*Indian Med. Gaz.*, lxii, 11, pp. 603–614, 10 pl. (2 col.), 1927.

This is a full account of the clinical symptoms, etiology, morbid histology, mycology, and treatment of pityriasis capitis caused by *Malassezia* [*Pityrosporon*] *ovale* [*R.A.M.*, vi, p. 95], based on a number of cases examined at the Calcutta School of Tropical Medicine and Hygiene.

BARDELLI (P. C.). **Sulla natura del virus della linfangite criptococcica e sulla sua asserita filtrabilità.** [On the nature of the virus of cryptococcic lymphangitis and on its alleged filterability.]—*Ann. d'Igiène*, xxxvii, 12, pp. 857–862, 1927.

It has recently been suggested by C. Casagrandi (*Atti Soc. Med.-Chirurg., Padova*. 1925) that epizootic lymphangitis of the horse, associated with *Cryptococcus farcinimosus* [*R.A.M.*, vi, p. 417], is due to an ultramicroscopic virus. On this basis the successful results obtained in inoculation experiments with *C. farcinimosus* by the present author and others are explicable only by the presence of such a virus in pure cultures of the fungus. However, further experiments [which are described] on three horses and a mule showed clearly that the typical symptoms of the disease can only be reproduced by inoculation with pure cultures of *C. farcinimosus*, and not with filtrates of these cultures. There is thus no reason to suppose that an ultra-microscopic virus plays any part in the etiology of epizootic lymphangitis.

KOŇOPACKA (Mme W.). **Mączniak rzekomy na Różach.** [Downy mildew of Roses.]—Reprinted from *Roczniki Nauk Rolniczych i Leśnych* [*Yearbook of Agricultural and Forestry Science*], Poznań, xviii, 4 pp., 1927. [English summary.]

After giving a brief, popular account of downy mildew of roses caused by *Peronospora sparsa*, and of its geographical distribution

in Europe, the author states that the disease was discovered in 1926 on one-year-old seedlings of *Rosa canina* in a commercial garden in Lublin, this being, so far as she is aware, the first record of the fungus in Poland. The seedlings had been raised from seed imported from Vienna, and the inference is that the disease had been introduced with the seed, the more so as all seedlings of local origin were entirely healthy. The disease also spread to some seedlings of *R. rubiginosa* in close proximity to the infected seedlings of *R. canina*, but did not do any serious damage. Good results in its control were obtained by spraying the diseased seedlings with 0·5 per cent. Bordeaux mixture.

PAPE (H.). **Eine häufige pilzparasitäre Blattfleckenkrankheit der Christrose.** [A common parasitic leaf-spotting fungous disease of the Christmas Rose.]—*Gartenwelt*, xxxii, 1, pp. 9–10, 2 figs., 1928.

In addition to the comparatively rare *Peronospora pulveracea* and *Phyllosticta helleborella, Coniothyrium hellebori* injures the foliage of Christmas roses (*Helleborus niger*) [*R.A.M.*, vi, p. 360]. Affected leaves develop irregularly spherical, dark brown to black, concentric, sometimes confluent lesions, measuring 1 to 3 cm. across. The diseased tissues shrivel and often fall out. In severe cases the leaves turn yellow and die prematurely.

The dark brown, spherical pycnidia of the fungus, which are formed mainly on the upper side of the leaves, measure 150 to 235 μ in diameter, and the unicellular, oval, light brown to olive conidia, 6 to 7·5 by 3 to 4 μ.

The disease, which is widely distributed in Europe and has been reported from America, also attacks other species of *Helleborus*. Infection appears to be most prevalent on plants growing in dry soils and in sunny situations. Control measures are indicated.

NANNIZZI (A.). **Sullo svernamento dell' 'Oidium Evonymi-japonici' (Arcang.) Sacc.** [On the hibernation of *Oidium euonymi-japonici* (Arcang.) Sacc.]—*Atti R. Accad. Fisiocritici Siena*, Ser. X, ii, 4–6, pp. 399–403, 1927.

The author has observed what appears to be a rare method of hibernation of the mildew *Oidium euonymi-japonici* [*R.A.M.*, iii, p. 159] on a few bushes of *Euonymus japonicus* growing in very shady positions in Siennese gardens. The mycelium stimulates the formation in the leaves of a phellogenic meristem of epidermal origin, which results in the development of a suberized layer preventing further penetration by the fungus. The mycelium and chlamydospores were found to overwinter in this suberized layer and to cause infection of new growth in the following spring.

NANNIZZI (A.). **Parassitismo facoltativo del 'Trichothecium candidum' Wallr. sull' 'Oidium Evonymi-japonici' (Arcang.) Sacc.** [Facultative parasitism of *Trichothecium candidum* Wallr. on *Oidium euonymi-japonici* (Arcang.) Sacc.]—*Atti R. Accad. Fisiocritici Siena*, Ser. X, ii, 4–6, pp. 405–408, 1927.

The author found *Trichothecium candidum* growing as a faculta-

tive parasite on *Oidium euonymi-japonici* [see preceding abstract], the mycelium of which it penetrated and destroyed. The optimum temperature for the development of *T. candidum* under these conditions was determined to be 25° to 28° C., the thermal death point for the conidia being 48° to 50°. This is stated to be only the second case on record of *Trichothecium* as a parasite of other fungi, the first being *T. helminthosporii* on *Helminthosporium ravenelii* (*Rev. Myc.*, 1879) [but see *R.A.M.*, ii, p. 277].

DRAYTON (F. L.). **Plant pathology, Central Laboratory.**—*Rept. Dominion Botanist for the year 1926, Div. of Botany, Canada Dept. of Agric.*, pp. 9–17, 4 pl., 1927.

Field experiments on the control of dry rot of gladioli (*Sclerotium* sp.) [*R.A.M.*, v, p. 430] were continued during 1926 with organic mercury compounds, but no marked success was obtained. Recommendations are made for the control of this disease and also of hard rot and scab (*Septoria gladioli* and *Bacterium marginatum*, respectively) [ibid., iv, p. 286; v, p. 164] of the same bulbs.

SAMPSON (KATHLEEN). **Disease of Grasses caused by Epichloe typhina.**—*Nature*, cxxi, 3038, pp. 92–93, 1928.

During the past seven years *Epichloë typhina* has caused great damage among some valuable breeding plants belonging to eight species of Gramineae at the Welsh Plant-Breeding Station, Aberystwyth. The studies described in the present paper have been conducted chiefly on *Festuca rubra*, in which the conidial stage of the fungus develops on the exserted panicles, instead of filling the spaces between successive leaves of the fertile shoot, as in most grasses.

E. typhina was found to possess a slender intercellular mycelium which permeates the stems and leaves of infected plants at all times of the year. Field experiments have proved that the fungus is perpetuated by vegetative propagation of the host [cf. *R.A.M.*, iii, p. 584]. Seed collected from diseased specimens of *F. rubra* has consistently produced a high percentage of infected plants. Visible symptoms of attack do not appear until the second or third year of growth, but microscopic examination of the seedlings reveals the characteristic mycelium at the growing point and in the leaves. Some plants which remained barren for three successive years also contained mycelium in the vegetative organs. The mycelium has also been found in the floral organs and in the ripe seed.

The mycelium occurs as scattered strands in the paleae and pericarp, but is most abundant immediately outside the aleurone layer and between the endosperm and the scutellum. It does not appear to penetrate the cells. It has been traced within the tissues of the embryo, and in the first leaf of seedlings grown from infected seed under aseptic conditions.

Attention is drawn to the parallel cases of the invasion of various species of *Lolium* by an endophytic fungus, and of the mycorrhizal fungus described by Miss Rayner on *Calluna* [ibid., ii, p. 326].

A fungus with an intracellular mycelium of the Phycomycete type, resembling the form recently described in the mycorrhiza

of wheat, *Lolium*, and other Gramineae [ibid., iii, p. 539; v, p. 379], has been found in the roots of *F. rubra*, *Dactylis glomerata*, and *Alopecurus pratensis*. It appears to be quite distinct from *E. typhina*.

McLarty (H. R.). **Report of the Dominion Field Laboratory of Plant Pathology, Summerland, B.C.**—*Rept. Dominion Botanist for the year 1926, Div. of Botany, Canada Dept. of Agric.*, pp. 132–141, 4 figs., 1927.

The author's experiments in the control of corky core of apples were continued on the same lines as in 1925 [*R.A.M.*, vi, p. 271], except that the irrigated plots received only one irrigation of 3·6 in. per acre. The least corky core (13·5 per cent. of the crop) appeared in a watered plot which also had a good cover crop, and the most (75 per cent.) in the only unwatered plot. The control plot showed 11·6 per cent. of affected apples.

Fire blight of apples [*Bacillus amylovorus*] was transmitted by pruning tools in only 9 out of 695 tests. Immature apples inoculated with the fireblight organism on 30th May, 1925, produced viable cultures of *B. amylovorus* as late as 30th March, 1926.

Perennial canker of the apple caused by *Gloeosporium perennans* was present in at least four districts in Saskatchewan. The author's observations [details of which are given] support the suggestion [ibid., vii, p. 178] that a definite relationship exists between infection and the woolly aphis [*Eriosoma lanigerum*].

Hopkins (C. J.). **An Apple disease occurring in the Elgin district.**—*S. Africa Dept. of Agric. Sci. Bull.* 61, 17 pp., 1 pl., 1927. [Mimeographed.]

Since 1924 a serious disease of apple trees has been spreading in orchards in the Elgin district (western Cape Province), 80 per cent. of the trees being affected in some cases. Both in this district and in Constantia, where the disease is present in a less virulent form, infection has evidently been present for a considerable number of years without attracting attention.

The symptoms of the disease bear a superficial resemblance to those of fireblight (*Bacillus amylovorus*), but as pear trees in the same orchard remained immune it appeared likely that this organism was not involved. A closer similarity was observed between the Elgin disease and that described by D. H. Rose (*Phytopath.*, vii, [p. 198], 1917) as due to *Pseudomonas papulans* and believed by A. S. Rhoads to be a form of apple measles [*R.A.M.*, iii, p. 722 *et passim*].

Infection almost invariably begins at the base of the tree in the form of slightly raised, blister-like lesions of irregular outline, measuring up to 1 cm. or more and sometimes coalescing. On removing the skin of the blister, a soft layer composed of greenish giant cells is exposed. In a few days small, longitudinal fissures appear in the centre of the blisters and the outer skin begins to loosen and peel away. The soft layer of giant cells becomes spongy and can finally be rubbed away like a dark brown powder. The pimply ridge described by Rose in connexion with scurfy bark canker [loc. cit.] is less marked, though sometimes present, in the

Elgin disease. From these initial lesions the disease begins to spread upwards and girdle the trunks. Many diseased trees persist in this condition for years in spite of the presence of dead limbs. Fruit production is apparently not affected by the Elgin disease, except in advanced stages. On young twigs the lesions are pale yellow to brown and the bark adheres more closely to the stem than in the older limbs. The symptoms of the disease first appear about the end of August and culminate a month later; by December most of the lesions have dried up, the well-marked fissures surrounding them bearing a strong resemblance to the hold-over cankers of fireblight.

Inoculation experiments with pure cultures of a bacterial organism isolated from diseased tissues gave positive results on wounded but not unwounded twigs. A general tendency was observed for the disease to start on the side of the morning sun, indicating that the causal organism may enter the bark through the small cracks arising from the sudden expansion due to the heat on the frozen bark. The initiation of the disease at the base of the tree points to the conveyance of the causal organism in drainage water. Infection was also proved to be carried by a small, ant-like beetle, *Formicomus coeruleus*. The wind, too, probably assists in the spread of the disease, which may also be disseminated by prunings from infected trees as well as by the shears used in the pruning operations.

The organism is a short, highly motile, Gram-negative rod with rounded ends, varying considerably in size on different media. In preparations stained with carbol fuchsin and watery methylene blue the dimensions were 1·5 to 2·3 by 0·6 μ. No spores could be detected but capsules are present. On nutrient agar the glistening white colonies emit a foetid odour in the early stages. Gelatine is slowly liquefied and milk cleared; nitrates are not reduced. Good growth is made in +10 bouillon and two strains of the organism developed in Uschinsky's solution, but no growth occurred in Cohn's. No acid or gas was produced in the common sugars.

A table is given showing the cultural differences between *P. papulans*, *B. amylovorus*, and the Elgin organism. These are sufficient, in the author's opinion, to indicate the existence of three distinct species; *P. papulans* and the Elgin bacterium, however, are fairly closely related. As regards morphological characters, the arrangement of the flagella is quite different in the three types, those of the Elgin organism being monopolar, those of *P. papulans* bipolar, and those of *B. amylovorus* peritrichous [ibid., vi, p. 732].

In field experiments on the control of the Elgin disease the best results were given by liberal applications of zinc chloride (1 in 100) [ibid., vii, p. 180]. The scarification method, combined with the application of Reimer's mercuric cyanide and mercuric chloride solution, as used against fireblight [ibid., iv, p. 547], was effective, but this process is too laborious for use on a large scale. Every effort should be made to protect the trees from injury of any kind and to maintain their vitality by suitable cultural methods. Whitewashing of the trees is essential, the mixture being sprayed or painted on to a height of 4 ft. from the ground. Excessive ferti-

lization with nitrogenous manures should be avoided, and the soil kept moderately dry with the aid of cover crops or green manures. Pruning implements should be dipped in formalin between use on each tree.

LEVOSHIN (V. K.). К вопросу о заболевании коры Яблони в условиях Нижнего Поволжия. [On the problem of the bark diseases of the Apple under the conditions prevailing on the Lower Volga.]—*Материалы по Микологии и Фитопатологии* [*Materials for Mycol. and Phytopath.*], Leningrad, vi, 1, pp. 214–226, 4 figs., 1927.

Bark diseases of apple trees are stated to be widespread in all fruit-growing districts on the lower reaches of the Volga, with an incidence varying from 50 to 90 per cent. of the trees, in many cases attaining such a degree of severity as to render their recovery out of the question. A careful inspection of the principal apple orchards in the government of Saratoff showed that the organism chiefly responsible for the damage is *Sphaeropsis malorum* [*Physalospora cydoniae*: *R.A.M.*, vi, p. 491], which was invariably present in all the trees examined, although local growers usually attribute the damage to the action of severe frosts in the winter and of sun scorch in the summer. The latter are considered to be only contributory factors which injure the bark and allow of its invasion by the fungus, which is thought to be a wound parasite. Further spread of the disease is greatly favoured by bark-borers that are always present in large numbers. Another factor largely responsible for the susceptibility of the trees to fungal attack is the drastic method used in many orchards of cleansing the trunks from moss and lichens, as in this operation not only is the old bark removed, but frequently the cambium is injured by scraping too deeply. This seems to be the reason why the main injury from the fungus is found on the trunks and big limbs, while the basal part and the crown of the trees are attacked only rarely. It was also noted that more or less prolonged periods of drought predispose the trees to the disease, while in rainy seasons or in well irrigated orchards, severely attacked trees were frequently observed to recover in a remarkable way. Keeping the soil in the orchards well tillered and free from weeds also appeared to reduce the incidence and severity of the disease. Painting the trunks with lime wash in the spring has not only a controlling effect on the fungus, but it prevents sun scorch of the bark during hot days, and thus contributes towards keeping the trees in good health.

Considerable variations in susceptibility of different varieties of apple to infection with *P. cydoniae* were observed, the capacity for rapid formation of cork around the cankers appearing to be one of the principal factors concerned in varietal resistance.

Blister disease of Apples.—*New Zealand Journ. of Agric.*, xxxv, 5, p. 318, 1927.

An obscure condition of the apple, referred to as 'blister' disease, is reported to have appeared recently in the Motueka district of New Zealand. The lesions which occurred on the fruits bore a species of *Coniothecium*, but this is considered to be of secondary

importance and the disease is attributed to physiological irregularities resulting from unfavourable weather, root injury, and inadequate drainage. These causes are similar to those that have been held responsible for the 'brown core' disease of apples [*R.A.M.*, vi, p. 735], and for the unusual prevalence of die-back of Delicious and Sturmer apples during the same period.

Müllers (L.). **Die verschiedenen Arten des Obstbaumkrebses und ihre Bekämpfung.** [The various types of fruit tree canker and their control.]—*Obst.- und Gemüsebau*, lxxiii, 25, pp. 388–389, 2 figs., 1927.

A brief, popular account is given of the open and closed cankers of fruit (especially apple) trees caused by *Nectria galligena*. White winter and red autumn Calvills, Landsberg, Canada, and Champagne Reinettes, Red Stettin, Geflammter Kardinal, and winter Golden Pearmain are stated to be highly susceptible to canker, while Beauty of Boskoop, Boiken, Jacob Lebel, Rhenish Winter Rambour, Grüner Fürstenapfel, Gravenstein, Langton's Nonpareil, and Red Star Reinette are more resistant.

Culpepper (C. W.) & Caldwell (J. S.). **The relation of atmospheric humidity to the deterioration of evaporated Apples in storage.**—*Journ. Agric. Res.*, xxxv, 10, pp. 889–906, 1927.

Slices of Ben Davis, Delicious, Rome Beauty, Winesap, and Yellow Transparent apples were evaporated to a moisture content of approximately 15 per cent.: (*a*) immediately after slicing, (*b*) after heating to 80° C. for 15 minutes, (*c*) after dipping in 2 per cent. cold sodium chloride for 10 to 15 seconds, or (*d*) after exposing for 30 minutes to burning sulphur. They were then placed in bell jar storage chambers at various relative humidities between 0 and 100 per cent. These were kept for 12 months at 25° and then placed in a laboratory the temperature of which ranged from 20° to 30°. Free access of air was allowed to all the fruit.

The results [which are tabulated and fully discussed] show that at relative humidities not higher than 18·8 per cent. the apples retained their original colour, odour, and flavour during the whole storage period of three years and three months. At constant humidities between 47·2 and 80·5 per cent. deterioration in colour, odour, and flavour was well marked after 112 days in all fruit with a moisture content exceeding 18 per cent., while after three years all the material at these humidities having more than 10 per cent. moisture was unmarketable. There was, however, no visible growth of moulds or yeasts, nor do the authors consider the changes as due to the action of enzymes, since they occurred equally in fruit heated to 80° C. or treated with sulphur dioxide or sodium chloride and in untreated material.

At relative humidities above 80·5 per cent. the absorption of moisture was such as to permit an abundant development of moulds and yeasts, which destroyed the material in a few months.

Of the treatments given before evaporation, that with sulphur dioxide retarded the development of the changes rather longer than the others. Sodium chloride was next in effectiveness, but produced a characteristic pink discoloration in some of the varieties.

Considerable varietal differences were observed in the rate of deterioration, which was most rapid in Yellow Transparent apples, which had the highest total acidity (1·942) and hydrogen-ion concentration (3·36).

Total arrest of deterioration in evaporated apples for prolonged periods can be accomplished by reducing the moisture content to not more than 8 per cent. Atmospheric humidity in the storage chamber should be kept at or below the point of equilibrium with the moisture content of the material, to which access of atmospheric oxygen should be prevented.

ARTHUR (J. M.) & BENJAMIN (M. S.). **Preservation of whole fruit with sulphur dioxide.**—*Agric. Gaz. of New South Wales*, xxxviii, 11, pp. 873–875, 1927.

Experiments at Hawkesbury Agricultural College, New South Wales, showed that whole Cyca Smomo blood-plums preserved in a 0·08 aqueous solution of sulphur dioxide [*R.A.M.*, v, p. 309] remained fresh and sound after two months, and that the natural colour and sweetness of the fruit, which were adversely affected by the process, were partly restored by subsequent cooking. Similar results were obtained when grapes were bottled in 0·08 and 0·06 per cent. solutions of sulphur dioxide; the natural flavour of the fruit was unaffected after three months, but cooking, while it partly restored the colour of the black varieties of grape used (Gros Maroc and Gros Guillaume), did not do so in the case of Flame Tokay, a pink variety.

DODGE (B. O.). **A Gloeosporium blight of Raspberry.**—*Phytopath.*, xvii, 11, pp. 769–774, 2 pl., 1927.

A disease causing considerable damage to red raspberry hybrids at Bell, Maryland, and found also on black raspberries in Kentucky, Ohio, Michigan, and elsewhere, is termed *Gloeosporium* blight. The first symptom of infection on the Cumberland variety is a blackening or necrosis of the petioles and tips of young shoots. Later the leaves collapse and the shoots turn purple or blue from the tip downward. Entire canes may be affected or there may be only a broad, white or pale grey streak of dead tissue along one side, or a dead area at the base of a dead lateral. Infected canes become girdled and eventually die without producing fruit, and very often without even developing leaves.

Two different strains of the *Gloeosporium*, a chromogenic and a non-chromogenic, were obtained in culture and the latter produced perithecia agreeing with those of *Glomerella cingulata*. About fifty single ascospore cultures have been obtained from these, and have maintained their non-chromogenic character. All the other cultures made from the fungus on red raspberry hybrids at Bell and at Rosslyn, Virginia, have been chromogenic.

Cross-inoculation experiments with the chromogenic strain from raspberry and with a chromogenic and a non-chromogenic strain from apple demonstrated the pathogenicity of the three strains to both hosts. Attempts to infect the raspberry by spraying uninjured canes with spore suspensions gave negative results, indicating

that the fungus does not readily penetrate the unruptured epidermis under normal growing conditions.

Blattný (C.). **O virusových chorobách Malinníku a Ostružinníku.** [Virus diseases of Raspberries and Blackberries.]—*Ochrana Rostlin*, vii, 3–4, pp. 62–70, 2 figs., 1927.

Virus diseases of cultivated and wild raspberries and of blackberries are stated to be spreading in all the low lands of Bohemia, south Moravia, and at the foot of the Carpathians, owing to the abundance in those regions of insect vectors, among which *Rhopalosiphum rubi*, *Aphis idaei*, and an undetermined species of *Aphis*, have been definitely shown by the author's experiments to transmit the diseases. The incidence of these diseases decreases with the altitude, and above 700 m. they are to be met with in very rare cases, if at all. As the wild berries in these areas constitute an important item of home and export trade, the necessity of taking measures to prevent the spread of these diseases to the still uninfected areas is emphasized. Of interest is the author's remark that the spread of the virus diseases of raspberries and blackberries coincides very closely with that of the virus diseases of the potato, the suggestion being made that the former may serve as an indicator as to whether a given region is safe for the breeding of seed-potatoes.

In raspberries the author distinguishes the following virus diseases. (*a*) Ordinary mosaic, occurring in two forms, the first of which is characterized by the appearance on the young shoots, in late spring, of irregular, blister-like bulges on the upper surface of the leaves, within which the tissues, particularly along the veins, show a yellowish discoloration. In the years following initial infection, the bushes only produce stunted shoots with very small leaves, and a few flowers which either remain abortive or form small, hard, and tasteless berries. Infected cuttings root very slowly, and usually dry from the top downwards. The second form presents the same symptoms as the first, with the exception of the blister-like deformation of the leaves. (*b*) Speckled mosaic, a very mild form observed on wild raspberries in north Bohemia, in which the leaves retain their normal green colour, while a few scattered, yellowish specks appear on the youngest. Bushes infected with this form usually lose their fertility in five or six years. (*c*) General mosaic, particularly prevalent in south Bohemia, which is characterized by a yellow discoloration of the entire leaf, advancing inwards from the margins, which are slightly curved downwards; the intercostal tissue frequently withers and drops out. Infected bushes are usually killed in from six to ten years. (*d*) Leaf curl: the leaves, especially the apical, are strongly curled outwards, and are at first of a lighter green colour than normal; towards the end of the summer the intercostal tissue turns reddish-brown and bulges upwards, while the veins are collapsed. Leaf curl is stated to be very widespread and to be of considerable economic importance in raspberry plantations.

In blackberries the author distinguishes the following types. Mosaic A: in the spring the young leaves are striped with lighter and deeper green; this marking disappears during the warm

summer months, but is again observed in the autumn. In the initial stages this form frequently passes unnoticed, but its effects appear to be cumulative, leading to a gradual stunting of the canes, reduction in the yield of berries, and finally the death of entire bushes. Mosaic B, characterized by small, yellowish-green leaves with margins curled upwards; the berries remain small and hard, and the infected bushes are rapidly killed. Mosaic C, which is believed to be mosaic (*a*) of raspberries transmitted to the blackberry by an insect vector, since it was experimentally transmitted from the former to the latter by means of aphids. In this connexion it is mentioned that mosaic (*a*) of raspberries has been proved to be transmissible to hops, on which it produces a mosaic of the streak type, easily visible in the spring and during periods of cold weather. Other virus diseases of blackberries are leaf curl and streak (rosette), brief descriptions of which are also given. It is emphasized that the symptoms may vary according to the hosts, the above descriptions referring to those varieties of the latter that are most common in the areas surveyed.

In regard to control measures, the recommendations include a strict selection of planting material from stocks that are known to be healthy, the installation of nurseries well protected from all insects, and a rigorous control of the latter. Where the incidence in the fields is not too high, roguing of all infected bushes should be carried out, care being taken to remove all the roots.

DRIGGERS (B. F.). **A comparison of dusts and spray to control fungus diseases of the Cranberry.**—*New Jersey Agric. Exper. Stat. Bull.* 450, 16 pp., 1927.

In a series of experiments in the control of fungous diseases of cranberries (chiefly *Guignardia vaccinii* and *Acanthorhynchus vaccinii*) [*R.A.M.*, vii, p. 185], carried out at Chatsworth and Hammonton, New Jersey, in 1925 and 1926, five or six applications of a Bordeaux soap spray (5–5–50 with 2 lb. resin fish-oil soap per 50 galls. of mixture) increased the yield and reduced the incidence of infection. Copper-lime dust was less effective than the Bordeaux-soap spray; of the different combinations of monohydrated copper sulphate and hydrated lime used, the 50–50 formula gave the best control. In one season's trials neither colloidal sulphur, dry ground Bordeaux, nor 25–75 copper-lime dust gave satisfactory control of the rot fungi on a badly infested bog; dry ground Bordeaux was the most promising of the three. Copper carbonate dust also proved ineffective for the control of these cranberry rots.

SCH. **Chemische Industrie und Pflanzenschutz.** [Chemical industry and plant protection.]—*Chem. Industrie*, 1, 45, pp. 1183–1187, 1927.

A general survey is made of the relations between the chemical industry and plant protection, with some statistics of the losses caused by fungous diseases in Germany and an account of the development of new or improved chemical methods for their prevention.

SACKETT (W. G.). **Soil sterilization for seedbeds and greenhouses.**—*Colorado Agric. Exper. Stat. Bull.* 321, 24 pp., 15 figs., 1 diag., 1927.

Two methods of soil sterilization for seed-beds and greenhouses are described. The perforated pipe method, suitable either to indoor or outdoor conditions, consists briefly in heating the soil to a depth of 10 to 12 inches by means of live steam under pressure introduced through perforated pipes laid under ground. With a steam pressure of 30 lb. the temperature can be raised to 200° F. to a depth of 10 inches in 3 to $3\frac{1}{2}$ hours. The following temperatures have been found requisite (*Indiana Agric. Exper. Stat. Bull.* 226, 1922) for the control of some common greenhouse soil fungi: *Pythium* 140°, *Rhizoctonia* on lettuce 140°, *Sclerotinia* on lettuce 176°, *Septoria lycopersici* on tomato 176°, and *Colletotrichum lindemuthianum* on beans 149°.

The inverted pan method, suitable for superficial sterilization of outdoor seed-beds, consists of a shallow, steam-tight, wooden box, inverted over the soil, beneath which steam under pressure is liberated.

YOUNG (R. C.) & WILLIAMS (R.). **Pentathionic acid, the fungicidal factor of sulphur.**—*Science*, N.S., lxvii, 1723, pp. 19–20, 1928.

The writers have carried out investigations to ascertain the definite chemical relationship of the toxic factor of sulphur to sulphur itself, and to determine the effect of certain factors influencing this relationship [*R.A.M.*, vii, p. 254].

The correctness of the conclusion reached by Freundlich and Scholz (*Kolloid. Beih.*, xvi, p. 234, 1922), namely, that pentathionic acid is a peptizing agent for sulphur made by the reaction of H_2S and SO_2, was assumed from the outset. On applying the ammoniacal silver nitrate test for pentathionic acid to sulphur, the characteristic brown colour develops and slowly changes to black. No precipitate of the respective sulphides, the only other sulphur compounds that might give the same test, appears when flowers or flour of sulphur are treated with lead acetate, copper sulphate, or silver nitrate. Sulphur treated with ammoniacal copper sulphate gives no precipitate even on standing, nor is any sulphide ion obtained after several hours' treatment of sulphur with ammonium hydroxide. Moreover, known solutions of sulphite, sulphate, or thiosulphate ions do not respond to the above test for pentathionic acid. It can only be concluded that ordinary forms of sulphur have pentathionic acid associated with them. It was further shown that the acid is completely adsorbed by the sulphur particle. Strong ammonia breaks down pentathionic acid to thiosulphate, but does not completely destroy the $S_5O_6=$ ion on the sulphur particle. Consequently, when the pentathionic acid test is used on ammonia-treated sulphur, the negative $S_5O_6=$ ion and the negative sulphur particle attract the positive $Ag(NH_3)_2+$ ion which reacts with the $S_5O_6=$ ion to form the characteristic compound finally resulting in Ag_2S.

A complete proof of the toxicity of pentathionic acid was obtained by using sulphur freed from this acid in a series of

germination tests with *S[clerotinia] cinerea* and *V[enturia] inaequalis*. Pentathionic acid was completely toxic to both organisms at a strength of 0·062 per cent., but when treated with strong ammonia to destroy the acid and brought back to an acid reaction (P_H 6 or less) with hydrochloric acid, the spores germinated as freely as in the controls. When sulphur was treated with strong ammonia and brought back to P_H 6, immediate germination tests were positive, but the suspension soon became toxic. Sulphur in the presence of oxygen and moisture is a continual source of pentathionic acid until equilibrium is reached.

Sulphur prepared from H_2S and SO_2 is similarly affected by strong ammonia, except that the $S_5O_6=$ ion is much more abundant, reacting more rapidly to the pentathionic acid tests and recurring more quickly after treatment of the sulphur with ammonia.

Pure pentathionic acid is not so completely destroyed with bases such as $Ca(OH)_2$, KOH, or NaOH. These react directly, each forming the respective pentathionate. They were non-toxic to the organisms used, but regained their toxicity when brought to P_H 6 or below with HCl.

It is claimed from the above results that pentathionic acid is the toxic factor of sulphur and that this compound is sensitive to basic materials. The data further show that the natural oxidation and dissolution of sulphur gives a continuous yield of pentathionic acid, particulate sulphur oxidizing more readily and therefore being more toxic. These results explain the frequent failures of so many commercial dusts and sprays composed of basic compounds which assist in spreading and sticking but inhibit toxicity.

WINKELMANN (A.). **Ueber die Einwirkung verschiedener Metalle auf Lösungen von Beizmitteln.** [On the action of various metals on fungicidal solutions.]—*Zeitschr. Angew. Chemie*, xl, 47, pp. 1393–1394, 1927.

The behaviour of solutions of mercurial fungicides of standard strength during 30 or 60 minutes' contact with sheets of iron, copper, or zinc has been investigated. None of the metals seriously affected germisan or segetan-neu; iron precipitates practically all the mercury from kalimat B and weizenfusariol, and the greater part from urania and uspulun. Zinc precipitates large amounts of mercury only from fusariol, while copper is badly corroded by urania and precipitates negligible quantities of mercury from uspulun and fusariol. The last-named preparation exerts such a strong corrosive action that it should never be placed in metal containers or brought into contact with the metal parts of apparatus.

FRIEDRICHS (G.). **Untersuchungen über Trockenbeizung. 1. Einwirkung von Trockenbeizmitteln auf Eisengeräte.** [Investigations on dusting. 1. Action of dusts on iron apparatus.]—*Pflanzenbau*, iv, 10, pp. 145–149, 2 figs., 3 graphs, 1927.

The writer's investigations [details of which are given] showed that tutan, abavit B, and other fungicidal dusts are very liable to

corrode the iron parts of steeping apparatus and drills. The parts of the machinery exposed to contact with the dusts should therefore be protected by a coat of paint. Tillantin, P. 102 (Heyden, Radebeul-Dresden), and Sch 780 (Farb. Indus. Höchst) did not cause corrosion in these experiments. A serious disadvantage attaching to the use of preparations with marked hygroscopic properties, e. g., tutan and preparation 225, is the tendency of treated seed-grain to clog the drill unless sown immediately. These two drawbacks must be eliminated before dusting can be of any great practical utility.

HEMMI (T.) & NOJIMA (T.). **Contributions to the knowledge of anthracnoses of plants. I. Notes on three new or little known anthracnoses of the cultivated plants in Japan.**—*Mem. Coll. Agric., Kyoto Imper. Univ.*, 3, Art. 2, pp. 26–39, 1 pl., 2 figs., 1927.

At the end of July, 1926, the writers' attention was drawn for the first time to an outbreak of onion smudge (*Colletotrichum circinans*) [*R.A.M.*, iii, p. 118] at Kyoto, Japan. The pathogenicity of the fungus, the conidia of which measured 18 to 28 by 3 to 4 μ, to the scales of mature coloured onion bulbs was proved by inoculation experiments.

Aucuba japonica has recently been attacked in the Kyoto district by a disease causing a grey discoloration of the twigs. The causal organism was found to be a species of *Colletotrichum* with dark brown setae, swollen at the base and up to 82·5 by 4 to 13·5 μ in diameter, and hyaline or slightly yellowish, ellipsoid to oblong-ellipsoid, or wedge- or cocoon-shaped conidia, measuring 18·75 to 40·08 by 7·5 to 15 μ (mostly 22·5 to 38·4 by 9 to 13·36 μ). These dimensions considerably exceed those of *Gloeosporium aucubae* (4 to 7 by 2 to 3 μ) and *C. pollaccii* (12 to 19 by 6 to 8 μ), and the fungus is therefore regarded as a new species, *C. kiotoense*, a Latin diagnosis of which is given.

In 1920–21 Hemmi published the results of some experiments on the physiological characters of a species of *Colletotrichum* or *Gloeosporium* causing anthracnose of poppies [*Papaver* spp.] (*Journ. Coll. Agric., Hokkaido Imper. Univ., Sapporo, Japan*, ix, pp. 1, 305, 1920–1921). The diseased areas occur in the shape of irregular, brick-red or salmon-coloured lesions on the ovaries, ripe fruits, and stalks. The conidia are fusiform, oblong-fusiform, or oblong-ellipsoid, slightly acute or rounded at both ends, and measuring 7 to 18 by 3 to 4·4 μ. The pathogenicity of the fungus to uninjured poppy capsules was proved and it was also found that similar symptoms were produced by inoculating poppies with cultures of the organisms causing apple bitter rot and fig anthracnose (*Glomerella cingulata*). Positive results were obtained by the inoculation through punctures of Ralls and Smith Cider apples, and of grapes, with the poppy organism under humid conditions. These data are considered to indicate that *G. cingulata* is the causal organism of the poppy anthracnose.

The temperature relations of this strain of *G. cingulata* are very similar to those of one of the two distinct Japanese strains of the fungus on apple, while the cultural characters of both strains on

artificial media are also indistinguishable. These strains appear to be identical with the chromogenic form (which the authors think may possibly prove to be a distinct species) described by Shear and Wood (*U.S. Dept. of Agric., Bur. Plant. Indus., Bull.* 252, p. 1, 1913), while the chromogenic character is absent from the strain causing fig anthracnose.

NOBÉCOURT (P.). **Contribution à l'étude de l'immunité chez les végétaux.** [A contribution to the study of immunity in plants.]—174 pp., Lyons, Imprimerie Bosc Frères & Rion, 1927.

After reviewing in considerable detail previous investigations upon plant immunity, the author describes a prolonged series of researches on this subject undertaken at the University of Lyons and the Arloing Institute, Tunis. Full details of the experiments and discussions of their bearing on the general problem are given, but only a few can be mentioned here.

The main conclusion is that although immunity may be sometimes attributable to simple chemical or mechanical factors (e.g., the immunity of the leaves of the cherry-laurel [*Prunus laurocerasus*] from *Botrytis cinerea* is attributed to the production of benzoic aldehyde), in general, chemical and mechanical factors are not of the first importance. In particular, the author's tests with alkaloids and essential oils indicated that these substances have little to do with immunity, except in a few special cases. So also many fungi grow readily in the juices of plants immune from their attacks. Many fungi and bacteria secrete a thermolabile toxin, as well as an enzyme (pectinase) which dissolves the middle lamella of the plant cells; they can also secrete thermostable toxins. Oxalic acid was absent in certain virulent cultures of fungi which have been supposed to owe their toxic action to this substance. Plant juices can often prevent or weaken the toxic action of these secretions, but this is not always related to the immunity of such plants from the attack of particular parasites and is not comparable with the action of animal antitoxins. The inhibitory action was not increased by previous injection of the tissues with the secretions of the fungus. Only in the case of bulbs of the orchid *Loroglossum* [*Himatoglossum*] was evidence obtained that the action of a fungus, the endophyte of the orchid mycorrhiza, *Orcheomyces* [*Rhizoctonia*], could induce the development of substances antagonistic to the growth of the latter, thus confirming the author's earlier results, questioned by Magrou [*R.A.M.*, iv, p. 183]. Even in this case, however, the inhibitory action was not always evident, temperature, the age of the cultures, and other factors seeming to play a part in the process, which was shown to be a reaction of the living cells but not to be chemotropic in its nature.

Fleshy fruits were found liable to attack by fungi which are unable to parasitize the vegetative organs, but this seems to be due merely to the reduced vitality of the fruit cells.

Chemotropism is not of paramount importance in relation to immunity and susceptibility; tomatoes and grapes were attacked readily by certain fungi when sown in drops on the surface of the fruit containing similar nutrient substances (juice of the fruit) to those within the fruit, while plants immune when alive from

a given fungus were attacked by it after they had been killed with chloroform. The immunity of carrots from the attack of *Rhizopus stolonifer* does not depend on the suberization of the cell walls, as suberization can be induced by submitting the tissues to the action of chloroform (which kills the surface cells and causes the developmen of a suberized zone in the deeper tissues), and inoculation after this process is completed gives positive results. Once the fungus gains a footing in the dead surface cells it can readily penetrate the suberized layers below. It was demonstrated that this is due to the fact that the suberized walls are permeable to the toxic secretions of the fungus. Cicatrization was also shown to play no part in the resistance of the highly immune cladodes of *Opuntia ficus-indica* to the fungi tested. Carrots and turnips, although immune from *Botrytis cana*, did not secrete any substance negatively chemotropic to this fungus.

Attempts to produce anaphylaxis by the injection of a protein solution (normal horse serum) into hyacinth bulbs, bulbs and aerial leaves of onion, and stems of broad bean [*Vicia faba*] gave negative results, but artificial immunity of bean [*Phaseolus vulgaris*] seedlings (Soissons variety) was secured against the organism producing the 'toile' disease (*Botrytis cinerea*) by watering daily with the liquid taken from a culture of the fungus for 10 or 15 days before inoculation. Artificial immunity of broad bean seedlings from *Bacillus carotovorus* was also secured by injecting, 15 days before inoculation, from 0·5 to 1 c.c. of filtered liquid from a culture of *B. carotovorus.*

The chief factor in the production of immunity in plants is a strictly localized reaction between the secretions of the plant and those of the parasite.

A bibliography of nearly 250 titles is appended.

SARDIÑA (J. R.). **Sobre la inmunidad en las plantas.** [On immunity in plants.]—*Bol. Pat. Veg. y Ent. Agric.*, ii, 5–7, pp. 1–10, 1927.

This account of the writer's investigations on the formation of agglutinins and precipitins in plants has already been noticed from another source [*R.A.M.*, vi, p. 110].

COOK (W. R. I.). **The influence of environment on the infection by Ligniera junci.**—*Trans. Brit. Mycol. Soc.*, xii, 4, pp. 282–290, 1927.

In cross-inoculation experiments in which water-plants (chiefly *Ranunculus aquatilis* and *Callitriche stagnalis*) were grown in aqueous culture solutions of different hydrogen-ion concentrations, infection of healthy plants by *Ligniera junci* [*R.A.M.*, vi, p. 190] was obtained in solutions at P_H values of from 5 to 8 when the roots were protected from the light with silver sand. Infection was most readily secured in acid and neutral solutions, but did not take place even in these when the roots were unprotected, while infected plants similarly grown without root protection lost the fungus in less than three months.

These results are stated to confirm the conclusion previously reached by the author, that *L. junci* can attack plants growing in

acid or neutral soils only. Light is an inhibiting factor in the propagation of the fungus.

It is pointed out that although *Plasmodiophora brassicae*, *Spongospora subterranea*, and *Sorosphaera veronicae* are remarkably similar in their life-histories, they show diametrically opposite reactions to certain physiological stimuli, and that therefore the response of a particular member of the Plasmodiophorales to a series of physiological factors is of no value whatever in deducing the reaction of any other member, however similar in its general life-cycle.

THUNG (T. H.). **Physiologisch onderzoek met betrekking tot het virus der bladrolziekte van de Aardappelplant, Solanum tuberosum L.** [Physiological investigation in connexion with the virus of the leaf roll disease of the Potato plant, *Solanum tuberosum L.*]—*Tijdschr. over Plantenziekten*, xxxiv, 1, pp. 1–48; 2, pp. 49–74, 2 pl., 1 graph, 1928. [English summary.]

Starch accumulation is an important characteristic of a large group of virus diseases to which potato leaf roll belongs [*R.A.M.*, vi, p. 370]. The investigations fully described and tabulated in this paper were undertaken to ascertain whether this phenomenon is due to abnormal enzymic action or to interference with starch translocation. The work was carried out with plants of the Paul Kruger (President) variety in a greenhouse. Secondarily infected plants were obtained by planting diseased tubers, while primary infection was secured by the inoculation of healthy plants with *Myzus persicae* [ibid., vii, p. 48].

The respiration of the diseased leaves was found to be higher per gram fresh weight as well as per gram dry weight per hour than that of healthy leaves. The respiration values of mature diseased and healthy leaves were roughly calculated as 3 and 2·5 mg. carbon dioxide, respectively, per gm. dry weight per hour at a temperature of about 24° C.

It was further shown that starch disappears (when estimated before and after respiration) at the same rate from healthy and diseased leaves. The diastatic enzymes, therefore, are apparently not affected by the leaf roll virus. Quantitative studies during the respiration experiments showed that larger quantities of materials disappeared during respiration than could be accounted for by starch and sugars only, and here also no material differences between healthy and diseased leaves in the rate of disappearance of these other unknown substances was found.

In plants kept in darkness the decrease in dry weight is caused by respiration and translocation. It was shown that in the diseased leaves the loss in dry weight did not appreciably exceed the quantity lost by respiration. Contrary to the normal process in healthy foliage there is no translocation in diseased leaves. Large quantities of sugars were present in shaded plants both before and after a period of 64 hours, so Murphy's theory that the absence of translocation is due to the insoluble condition of the plastic materials [ibid., iii, p. 162] is considered to be incorrect. Photosynthesis was found to be normal in the young leaves of diseased plants, but to decrease as soon as starch accumulation begins. The

older the plants and leaves become the more the accumulation of starch increases and the more the increment in weight due to photosynthesis decreases.

The activity of the assimilating enzymes can be determined by comparing the quantities of sugars, starch, and other materials present in the leaves. Diseased leaves always gave higher values for starch and sugars than healthy. If the starch-forming function were more intense, sugar could not be in excess in diseased leaves, since it would be rapidly changed to starch.

It has thus been shown that there are no differences between diseased and healthy leaves in the enzymic activities connected with photosynthesis, whether in the formation of starch and other unknown substances or in their disappearance. The increased respiration in diseased leaves must apparently be attributed to the larger quantities of carbohydrates present in them.

These data are considered to furnish conclusive proof that the accumulation of starch in potato plants affected by leaf roll is due to a disorganization of translocation. Phloem necrosis, however, must be considered as a symptom of the disease, as transport has already been disturbed before any destruction of the conducting vessels is visible. In secondarily infected leaves starch accumulation occurs in the apical portions, beginning with the top leaflet, whereas in primarily infected leaves this process originates in the basal parts of the lowest pair of leaflets and proceeds upwards. Similar results were obtained when incisions were made in different parts of the conducting tissues. From these experiments it may be concluded that in primarily infected leaves the disorganization of translocation is restricted to the lower part of the petiole, which is not the case with secondarily infected ones.

It would appear from a study of these facts that starch accumulation is associated with a disturbance in the phloem beginning in the lower part of the petiole. The virus is transmitted to the leaves by aphids, the young developing shoots contracting primary infection with the nutrient substances that they receive from the older ones. Consequently the virus first reaches the lower portion of the petioles and there its disturbing action begins. In secondarily diseased plants, on the other hand, the whole sieve-tube system is heavily and uniformly infected.

The results of these investigations are interpreted as favouring the view that the virus is a living organism.

[This paper is reprinted as *Meded.* 33, *Laboratorium voor Mycologie en Aardappelonderzoek*, Wageningen, 1928.]

NEUMANN (G.). **Anbauwert einiger neuer pommerscher Kartoffelkreuzungen im Vergleich zu ähnlichen älteren Sorten auf Grund eigener und fremder Anbauversuche.** [The agronomic value of some new Pomeranian Potato crosses in comparison with similar old varieties on the basis of cultivation experiments, personal and otherwise.]—*Pommernbl.*, xxx, 36, p. 889, 1927. [Abs. in *Fortschr. der Landw.*, iii, 4, p. 176, 1928.]

The northern and eastern regions of Germany are stated to be particularly well adapted to the production of seed potatoes, since they are not subject to the degeneration diseases, especially leaf

roll, which affect the western and central parts of the country. Details are given of the writer's experiments in the development of new selections by hybridization, with notes on their individual characters, especially in respect of resistance to wart disease [*Synchytrium endobioticum*].

CROWTHER (E. M.), GLYNNE (MARY D.), & ROACH (W. A.). **Sulphur treatment of soil and the control of wart disease of Potatoes in pot experiments.**—*Ann. of Appl. Biol.*, xiv, 4, pp. 422–427, 1 diag., 1927.

In pot experiments [which are described and discussed] on Arran Chief potatoes grown in an acid soil from Stalybridge, Cheshire, artificially infected with *Synchytrium endobioticum* [*R.A.M.*, iv, pp. 501, 696] treatments with sulphuric acid and various combinations of sulphur and calcium carbonate, yielding a wide range of soil reaction, gave almost complete freedom from wart infection when the soil acidity exceeded P_H 3·4 [cf. ibid., iv, p. 764]. Sulphur and sulphuric acid had a similar effect in these tests. Heavy dressings of calcium carbonate, alone or with sulphur, giving a soil reaction of P_H 7·5 or more, also reduced infection. Medium dressings of calcium carbonate alone had no effect, but when sulphur was added infection was reduced, even though the acidity was less than in the untreated soil. These results support the conclusion drawn from previous field experiments, that sulphur in controlling wart disease does not depend entirely for its effect on a raising of the soil acidity.

Plant Pathologists' Conference.—*Journ. Dept. Agric. Victoria*, xxv, 10, pp. 613–620, 1927.

At the inter-State conference of plant pathologists held at Melbourne in 1927 [*R.A.M.*, vii, p. 249] the prevalence and distribution of powdery scab of potatoes (*Spongospora subterranea*) in Australia was discussed. The disease was stated to occur in Tasmania and New South Wales, but not in other parts of the country, and a committee was formed to inquire into the disease and recommend measures to prevent its spread.

ALCOCK (Mrs. N. L.) & MCINTOSH (A. E. S.). **Early manifestations of Potato blight (Phytophthora infestans de Bary).**—*Ann. of Appl. Biol.*, xiv, 4, pp. 440–441, 1 pl., 1927.

On 17th February, 1927, the authors gathered several apparently diseased shoots from potatoes sprouted in damp sphagnum moss indoors, all of which contained a large non-septate mycelium. One shoot was infected for about 1¼ in. from the base, the mycelium starting intercellularly and forming the large, lobular hyphae characteristic of *Phytophthora infestans*. In more severely infected areas, the mycelium was intracellular. Other shoots were affected only towards the apex as if by secondary infection. Two or three diseased shoots placed in water in a damp chamber produced conidiophores, the first appearing in 24 hours. Later on some of them also bore conidiophores without being removed from the tubers and many infections that were evidently secondary were found on the shoots from the sprouting tubers in the vicinity.

As external infection was unlikely, it is concluded that the shoots were infected in the first place internally from the tubers.

SCHLUMBERGER (O.). **Beobachtungen über einige krankhafte Erscheinungen bei Kartoffeln im Jahre 1927.** [Observations on some pathological conditions of Potatoes in the year 1927.] —*Illus. Landw. Zeit.*, xlvii, 44, pp. 568–569, 5 figs., 1927.

The widespread occurrence of *Phytophthora* [*infestans*] on potatoes in 1926 gave rise to the question of its possible transmissibility through the tubers. The writer's extensive observations point to the fact that, in general, late blight is not transmissible in this manner. Repeated tests with the Preussen variety showed that the plants developing from infected tubers are in no way inferior to those from healthy ones.

Similar data have been obtained in respect to sprain and hollow heart [ibid., vi, p. 179; vii, p. 264], the latter having been less prevalent in 1927 than the previous year. A dark brown, apparently non-parasitic spotting of the tissues surrounding the lenticels, probably due to deficient aeration, was observed for the first time in 1927 on the Böhm's Heimat variety [cf. *R.A.M.*, vi, p. 766]. This disturbance is also not transmissible by the tubers.

Many complaints were received in the spring of the current year concerning a necrotic condition of early potatoes (Holländische Erstling) from Holland. The tubers were shrivelled and the flesh showed a striped, greyish-brown discoloration. The disturbance, which apparently is not transmitted to the progeny, is thought to have been due to defective storage conditions or to injuries received during transport.

Rhizoctonia [*Corticium solani*] caused a serious delay of germination, and attempts to accelerate the growth of the plants by heavier top dressings resulted in scorching of the foliage.

POOLE (R. F.). **Sweet Potato disease studies in 1925.**—*Forty-seventh Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1926*, pp. 347–355, 1 pl., 1927. [Received March, 1928.]

Stem rot of sweet potatoes (*Fusarium hyperoxysporum* and *F. batatatis*) was more severe during the period under review than for five years past [*R.A.M.*, vi, p. 506]. The Red Jersey, Atlantic White, Nancy Hall, and Porto Rico varieties were the most susceptible. Even the resistant Red Brazil and White and Yellow Yam varieties, the cultivation of which is steadily increasing, were affected.

Observations on the residual effect of lime and sulphur on pox [*Cystospora batata* or *Actinomyces pox*: see above, p. 306] supported the data obtained in previous years. The yields on sulphured plots at the Vineland Training School were from 9 to 40 bushels larger where 300, 400, and 600 lb. were used than on those receiving smaller amounts, but the application of more than 300 lb. per acre is not considered justifiable. Lime causes a reduction in yield of 33 to 50 bushels per acre, and potash also was injurious.

Scurf or soil stain [*Monilochaetes infuscans*] was also reduced by the application of sulphur at the rate of 300 or 600 lb. per acre

while lime increased the incidence of infection. The application of sulphur over two consecutive years, however, caused a slight reduction of yield. None of the liquid disinfectants tested (formaldehyde, corrosive sublimate, Du Pont semesan, Bayer organic mercury, and Bayer uspulun) proved entirely effective in the control of scurf, but dusting with Du Pont organic mercury (2 oz. per bushel) reduced infection from 100 per cent. to nil, while Bayer organic mercury dust also was very satisfactory.

MANSHARD (E.). **Der Wert der rechtzeitigen Erkennung von Hafererkrankung auf saurem Boden.** [The value of the timely recognition of the Oat disease on acid soil.]—*Illus. Landw. Zeit.*, xlvii, 44, pp. 506–507, 3 figs., 1927.

Early in June, 1927, the writer observed the symptoms of the soil acidity [Hooghalen] disease [*R.A.M.*, vi, p. 578] in a field of oats. The leaves were of a livid yellowish-green colour, the tips (which were often slightly rolled) frequently showing a reddish tinge. The occurrence of green, 'tiger skin' spots [ibid., iii, p. 426] on the leaf sheaths was a striking feature of the affected plants.

Colorimetric determinations showed that the hydrogen-ion concentration of the soil in the affected parts of the field was P_H 3·85 compared with P_H 5·25 in the healthy areas. The condition of the plants was greatly ameliorated by the application to the soil of chalk lime at the rate of about 70 cwt. per hect., supplemented by a top dressing of sodium nitrate (1 cwt. per hect.).

BLODGETT (F. M.). **A Potato virus on Peppers.**—*Phytopath.*, xvii, 11, pp. 775–782, 3 figs., 1927.

Pepper [*Capsicum annuum*] plants inoculated early in 1925 with extracts from yellow dwarf and healthy potato tubers developed, in a fortnight, conspicuous symptoms differing from those produced on plants inoculated with the tobacco mosaic virus. This suggested that pepper would probably be a favourable host on which to test Johnson's theory that some element in the extract of normal potato foliage is capable of causing an infectious disease of tobacco and tomato [*R.A.M.*, v, p. 119]. A series of experiments, extending over a period of $1\frac{1}{2}$ years, was accordingly conducted on 25 lots of pepper plants.

Of 135 plants inoculated with the virus from apparently healthy potatoes of different commercial varieties, 114 developed symptoms of 'mottle' potato mosaic. Faint mottling develops on half-grown leaves, the pale areas of which rapidly become necrotic. The affected foliage soon drops and necrosis frequently spreads to the stems. The diseased plants are stunted. The 'mottle' virus, which is apparently identical with the mosaic virus B used by Fernow [ibid., v, p. 314] for the inoculation of *Nicandra physaloides*, *Nicotiana glutinosa*, and other hosts, could not be obtained from seedling potatoes from true seed. It is transmissible to such seedlings by inoculation.

The potato virus was found to be readily transmissible by inoculation from one pepper to another. It is not transmitted through the seed either of pepper or potatoes, but transmission occurs through potato tubers.

No information is yet available as to the extent of 'mottle' potato mosaic on pepper in commercial fields.

PRITCHETT (G. H.). **The principal Cane diseases and insect attacks affecting the several estates of Negros.**—*Sugar News*, viii, 11, pp. 883–892, 1927.

Notes are given on the chief fungous diseases affecting the sugar-cane crops in the highlands of Negros (Philippine Islands), the writer's observations being supplemented by citations from current phytopathological literature.

Java gum disease or leaf scald [*Bacterium* sp.] is prevalent on the Negros Purple variety. Fiji disease [*Northiella sacchari*] is mostly confined to laterite soils. Smut (*Ustilago sacchari*) [*U. scitaminea*] occurs principally in ratoons of Negros Purple, but it has also been observed on Uba and Barbados 146. Mosaic is the most widespread and serious disease of the Negros sugar-cane crops, the average annual loss from this cause during the past four years being 15 per cent. The efforts of the Philippine Sugar Association to introduce immune and highly resistant varieties have met with very disappointing results.

S. A. Sugar Association Experiment Station, Mount Edgecombe, Natal. Annual Report for the year 1926–27.—*African Sugar & Cotton Journ.*, i, 4, pp. 7–13; 5, pp. 9–15, 3 figs., 1927.

This report contains the following reference of phytopathological interest. The yields from streak-diseased and healthy sugar-canes at the pathological experiment stations Nos. 2 and 3 (African Explosives & Industries, Ltd., Umbogintwini) were compared [*R.A.M.*, v, p. 697]. Although much of the healthy planted cane had become diseased by secondary infection, there was a superiority in yield of healthy over streaked cane of 4·3 per cent. in unirrigated sandy soil, and of 8·8 per cent. in irrigated soil of a similar type. In the clay loam series of tests, the difference in favour of the healthy cane was 14·9 per cent. Similar figures were obtained in a corresponding test conducted on an estate at Umhlatuzi.

WOOD (E. J. F.). **Cane pests and diseases.**—*Queensland Agric. Journ.*, xxviii, 5, pp. 444–445, 1927.

The pink sclerotial disease of sugar-cane leaf sheaths designated 'spindle top' [*R.A.M.*, vii, p. 197] was very prevalent, especially on Badila canes, in the Innisfail district of Queensland during 1927, the losses in some areas being estimated at more than five tons of cane per acre. Flooded areas and those affected by grubs suffered most. The disease is marked by a rapid thinning out of the top of the cane stick; the leaf sheaths (on which the black sclerotia of the fungus can be seen) redden; and the cane becomes trashbound. Strangulation of the stem and growing point is followed by the death of the cane, often with resultant secondary rot. Affected canes should be rejected when planting, and where the disease is very severe the trash should be burnt.

BARNUM (C. C.). **Progress report on root rot investigations.**—*Planter and Sugar Manufacturer*, lxxix, 21, p. 406, 1927.

Examination of diseased roots of sugar-cane of the H 146 variety grown on Waipio soil in Hawaii failed to reveal the presence of any Chytridiaceous fungus, the organism most commonly found being a species of *Pythium* [*R.A.M.*, vii, p. 271]. The roots of eight plants of Lahaina cane planted in root study boxes became infected with various fungi, and diseased root tips were removed weekly. From 50 such roots, 44 cultures of *Verticillium*, 34 of *Fusarium*, 32 of *Rhizoctonia*, and 7 of *Pythium* were obtained, the last on alkaline media only. After twelve weeks, approximately 50 per cent. of the roots in the soil were completely rotted.

BARNUM (C. C.) & VAN ZWALUWENBURG (R. H.). **The relation of Pythium and the Collembolous insect Isotomodes to growth failure in Lahaina.**—*Planter and Sugar Manufacturer*, lxxix, 21, pp. 407–408, 1 graph, 1927.

In the authors' experiments, it was found that when pot cultures of Lahaina sugar-cane were inoculated with *Pythium* sp., isolated from the roots of the same variety [see last abstract], and colonies of 50 *Isotomodes* were placed on each of the same plants, plant growth was reduced by 20, and the number of shoots by 27, per cent. approximately. In other pots, the *Pythium* alone reduced growth by 4, and the number of shoots by 5, per cent. approximately, while the *Isotomodes* alone reduced growth by 9, and the number of shoots by 13, per cent. approximately. Red root lesions developed only when *Pythium* was introduced, but were more marked when *Isotomodes* were also present (in which case alone the root tips became softened), the presence of the insects increasing the number of *Pythium*-affected roots. *Isotomodes* alone or in combination with the fungus caused a marked reduction in secondary root formation, while plants inoculated with *Pythium* alone showed a very good secondary root growth. No plant-infesting nematodes were found in these experiments.

JACZEWSKI (A. A.). Карманный Определитель Грибов. Выпуск второй. Мучнисто-росяные грибы. [Pocket key for the determination of fungi. Part II. Powdery mildew fungi.]—Published by the A. A. Jaczewski Mycological Laboratory, State Institute of Experimental Agriculture, Leningrad, 626 pp., 119 figs., 1927.

This, the second, issue of the author's projected series of mycological handbooks [*R.A.M.*, vi, p. 260] contains a monograph of the Erysiphaceae that are known to occur throughout the world, with particular reference to those that have been recorded in Russia. In discussing the morphological and biological characters of the family as a whole, the author accepts Salmon's classification, according to which the various species are arranged in the book. The synonymy is very fully dealt with, and in every case the host and geographical ranges of the species are indicated. A special section deals with the haploid (conidial) forms of the Erysiphaceae, and in an appendix are enumerated 31 species which have been

erroneously referred to this family and should be excluded. The book terminates with a complete host index, and a bibliography of over 850 titles. In a separate table a synopsis is given of the Erysiphaceae arranged by the families of host plants.

Trabajos de las estaciones de fitopatología agrícola. [Operations of the Stations of Agricultural Phytopathology.]—*Bol. Pat. Veg. y Ent. Agric.*, ii, 5–7, pp. 48–60, 1927.

Lists are given of the parasitic fungi received during 1926 at the Stations of Agricultural Phytopathology at Madrid, Barcelona, Almeria, and Valencia.

Guilliermond (A.). **Sur la cytologie des Nematospora.** [On the cytology of *Nematospora*.]—*Comptes rendus Acad. des Sciences*, clxxxv, 25, pp. 1510–1512, 1927.

In describing the cytology of *Nematospora gossypii* [*R.A.M.*, v, p. 389] isolated from cotton seeds, the author states that on solid media the fungus rapidly forms numerous spore sacs that originate from intercalary cells of the mycelium; such cells (usually containing two or three, sometimes more, nuclei) begin to swell and produce 16 (occasionally fewer) spores by a mitosis similar to that which occurs in higher Ascomycetes. The spores are grouped in two bundles in the two halves of the spore sac; the latter soon bursts and liberates the spores, which frequently remain united to each other by their flagelliform appendages. The spores germinate by producing one or more germ-tubes from their central portion, which contains the nucleus. In *N. coryli* [loc. cit.], on solid media, the spore sacs are formed from yeast-like cells which originate from a budding of the mycelial hyphae. These cells do not arise from a previous fusion, and they never contain more than one nucleus to start with, but this divides by a mitosis similar to that in *N. gossypii*, and eight spores (frequently fewer) are ultimately formed. The spores are of the same shape as those of *N. gossypii*, and germinate by producing yeast-like cells or, less frequently, a mycelial thread.

The author concludes that *N. coryli*, like *N. phaseoli* [ibid., v, p. 202], has spore sacs presenting all the characters of asci, and should be considered as a yeast occupying, in view of its mycelial formation, an intermediate position between the Saccharomycetes and Endomycetes. On the other hand, *N. gossypii*, while apparently standing close to the Endomycetes, differs from the latter in its spore sacs, which are formed from plurinucleate cells and thus present the characters of a sporangium, though in their further development they partake of the nature of asci. These spore sacs, therefore, may be considered as intermediate between sporangia and asci, and for this reason it would perhaps be convenient to separate *N. gossypii* from the genus *Nematospora* and to refer it to the Hemiascaceae [cf. ibid., vi, p. 697].

Tobacco culture.—*Ontario Dept. of Agric. Bull.* 333, 35 pp., 26 figs., 1927.

This bulletin contains (pp. 32–33) some brief notes on tobacco diseases in Ontario. Mosaic is of common occurrence wherever the

crop is grown, infection being readily disseminated by the operations of topping and suckering. Control should be based on the use of fresh soil in the plant beds, crop rotation, roguing out of diseased plants, and keeping the bed free from weeds and at a distance from potato fields.

Root rot [*Thielavia basicola*] may be carried from the seed-bed to the field or it may already exist in fields used previously for tobacco. Red clover is known to perpetuate the causal organism and should be omitted from the rotation.

Damping-off [*Pythium de Baryanum*, *Rhizoctonia*, etc.] is frequently very serious on seedlings in thickly sown beds without proper ventilation and receiving an excessive supply of water. Control should be based on the avoidance of these conditions.

SIMMONDS (J. H.). **Irish blight of Tomatoes.**—*Queensland Agric. Journ.*, xxviii, 5, pp. 453–455, 1927.

A brief account is given in popular terms of the symptoms and mode of dissemination of Irish blight of tomatoes (*Phytophthora infestans*). In normal years the disease is not serious in Queensland, where the cooler months usually coincide with the dry season, but considerable losses are sustained if the growing period is cool and wet, as happened in the Bowen district during July and August, 1927. The usual control methods are recommended.

ČEREPENNIKOW (N.). **Vadnutí Rajských Jablek, působené houbou Sclerotinia libertiana Fuck.** [Tomato wilt caused by *Sclerotinia libertiana* Fuck.]—*Ochrana Rostlin*, vii, 5, pp. 86–88, 1927.

In July, 1927, during a spell of hot and dry weather, flowering tomato plants in a commercial garden in Bohemia were severely attacked by a fungous disease which killed them within a short time. The first symptom was a loss of turgor in the apical leaves, which rapidly extended downwards, so that two or three days later the whole plant dried up and drooped, although no yellowing of the leaves was noticed. The stems of the diseased plants were discoloured and constricted over a length of 6 to 10 cm., starting from a point 2 to 5 cm. above the collar. All the tissues in this portion were permeated by an abundant mycelium formed of hyaline, septate hyphae from 2·5 to 12 μ broad, which also penetrated into the apparently healthy tissues, beyond a dark brown margin, 2 to 4 mm. broad, to a distance of 3 to 5 cm. up and 0·5 to 1 cm. down the stem. The cavities inside the stems resulting from the decay of the pith were filled with a white, cottony mass of mycelium, containing from 4 to 8 oblong, black sclerotia, 3 to 4 by 6 to 15 mm. in diameter. Similar, but irregularly spherical instead of oblong, sclerotia were also produced by the fungus in pure culture.

The morphological characters of the fungus, and the nature of the symptoms caused by it, lead the author to identify it, pending further study, as *Sclerotinia libertiana* [*S. sclerotiorum*] which, hitherto, has been known to attack tomatoes only in the seedling stage. He emphasizes the polyphagous nature of this fungus, and also its capacity to live for long periods as a saprophyte in the soil. As control measures he recommends the immediate removal of all

diseased plants, the disinfection of the soil with a 2 per cent. solution of formalin, and (in small cultures) washing the diseased portions of the stems with 2 per cent. Bordeaux mixture.

MANSHARD (E.). **Krankheiten und Schädlinge im Saatbeet der forstlich wichtigsten Holzarten.** [Seed-bed diseases and pests of the principal forest trees.]—*Mitt. Deutsch. Dendrol. Gesellsch., 1927*, pp. 198–229, 2 pl., 1927.

Notes are given on the causes, symptoms, and control of a number of parasitic and non-parasitic diseases of young forest trees in Germany. The fungous diseases are classified in groups according to their hosts. *Thelephora laciniata* is mentioned as a cause of serious damage to seedlings of various species growing in soil rich in humus. The most important disease of Scotch pines (*Pinus sylvestris*) is stated to be the leaf fall caused by *Lophodermium pinastri* [*R.A.M.*, iv, p. 452], good control of which has been given by vomasol [ibid., vii, p. 245] in addition to various preparations previously recommended [ibid., v, p. 709].

McCALLUM (A. W.). **Forest pathology.**—*Rept. Dominion Botanist for the year 1926, Div. of Botany, Canada Dept. of Agric.*, pp. 17–20, 1927.

Since the previous report [*R.A.M.*, vi, p. 264], a survey made in the country adjacent to the Ottawa River and in the French River district, to study the distribution of *Ribes* in relation to white pine blister rust [*Cronartium ribicola*], revealed no infection on the currant type of *Ribes*, although *R. glandulosum* was found in all kinds of country, except bogs, but widespread infection on the gooseberry type, the commonest of which was *R. oxyacanthoides*. The author considers that the cost of eradicating *Ribes* from Ontario should approximate to one dollar per acre.

In the Kootenay area of British Columbia the two principal native *Ribes* are *R. viscosissimum* and the less susceptible *R. lacustre*. *R. petiolare* is less common but is the most susceptible to the rust. On the coast, *R. bracteosum* is the most susceptible species and is doing the most damage. At Daisy Lake there is more severe pine infection than elsewhere in western Canada, and trees up to 90 feet high will soon lose their tops. There is a centre of infection on *Pinus albicaulis* near the Pacific Great Eastern Railway, on the Tenquilla River.

FALCK (R.). **Tannensterben in der Eifel.** [Die-back of Firs in the Eifel.]—*Forstarch.*, iii, 23, pp. 397–409, 4 figs., 1927.

Since the spring of 1926, silver firs [*Abies pectinata*] in the Gemünd district of the Eifel [Rhine Province] have been affected by a die-back involving a brown discoloration of the tips of the branches and the progressive withering of the latter from the base of the tree upwards, with final infection of the root and collar by *Agaricus melleus* [*Armillaria mellea*]. The affected branches constantly show a reddish-brown discoloration and desiccation of the bark, associated with infection by *Dasyscypha calyciformis* and *Aleurodiscus amorphus*. The lemon-yellow apothecia of the former species are more common than the reddish or orange fruit-

ing bodies of *A. amorphus*, which have hitherto only been observed on the thicker branches. The dying branches are covered with the thick, black mycelium of the sooty mould *Apiosporium* [*Antennaria*] *pityophilum*, which grows on the secretions of the insects *Chermes nuesslini* and *C. piceae*. The latter are considered to be the primary cause of the disease.

The die-back of silver firs, like that of the oak [*R.A.M.*, vi, p. 126], would thus assume the character of a 'chain disease', in which subsidiary factors contribute to the development of the later stages. Both the insects and the bark fungi appear to be favoured by mild, damp weather. The control of the disease should be based on the elimination of one of the links in the chain. *D. calyciformis* may be combated by spraying trees with a mixture of resinol and copper salts, while carbolineum should be applied against the insects.

The author thinks it is doubtful whether the die-back of silver firs prevalent in Saxony and elsewhere [ibid., iv, p. 517, and next abstract] is identical with the disease occurring in the Eifel. The chief difference is that the more general form of die-back is characterized by the retention of the needles in the apex of the tree after the lower branches are dead. This feature is absent in the Eifel trees, which may possibly be affected by a particularly rapid and virulent type of the disease.

WIEDEMANN (E.). **Untersuchungen über das Tannensterben.** [Investigations on the die-back of Firs.]—*Forstwissensch. Centralbl.*, xlix, 21, pp. 759–780; 22, pp. 815–827; 23, pp. 845–853, 6 graphs, 1927.

An account is given of the author's extensive investigations on the nature and causes of the die-back of silver firs [*Abies pectinata*] in German forests [see preceding abstract]. This disease, which was first recorded in Germany about 1840, now occurs in a most serious form throughout the entire region of cultivation of silver firs, viz., from Denmark to Czecho-Slovakia and Switzerland. The results of detailed examinations in widely separated districts show that epidemics of die-back have constantly occurred after years of drought, e.g., 1890, 1904, and 1911. The economic importance of the disease may be gauged by the fact that in certain regions the reduction in the normal growth of affected trees amounted to between 50 and 80 per cent. for thirty years, and to over 90 per cent. during the last twenty.

Attention is drawn to some remarkable features of this die-back. Even in very severe cases the uppermost portion of the crown presents a healthy appearance. The formation of the so-called 'storks' nests' is due to the arrested growth of the terminal shoot as compared with the more rapid advance of the lateral branches. Generally speaking, this symptom becomes more pronounced as the disease progresses. The so-called 'damp heart' (Nasskern), mentioned by previous investigators, was observed by the writer in all the districts inspected. The heartwood at the base of the trunk is saturated with moisture, which in some cases extends to the sapwood. In very advanced stages this symptom may also be observed in the roots. In some cases numerous brown spots occur

in the ring immediately surrounding the heartwood, which becomes desiccated.

Discussing the etiology of die-back, the author deals at some length with the theories which have been advanced in explanation of the phenomenon. The disease has been attributed to meteorological conditions, to degeneration, to smoke injury, to certain silvicultural practices, to infection by the agaric [*Armillaria mellea*], by *Corticium amorphum* [*Aleurodiscus amorphus*], *Peziza* [*Dasyscypha*] *calyciformis*, and *Hysterium nervisequum*, and to invasion by the bark beetles, *Ips curvidens* and *I. piceae*. Until recently, however, scarcely any attention has been paid to *Chermes piceae*, which in the writer's opinion is the chief cause of the damage, all the other factors being of secondary importance. In view of the fact that the depredations of this insect are now extending to trees in the younger groups, there seems little hope of preserving the silver fir in German forests. This species, formerly regarded as highly resistant to all types of injury, has become one of the most susceptible of cultivated trees.

SOLOVIEFF (F. A.). О гнили Ели вызываемой грибом **Polystictus triqueter Fr.** [A rot of Spruce caused by *Polystictus triqueter* Fr.]—*Материалы по Микологии и Фитопатологии* [*Materials for Mycol. and Phytopath.*], Leningrad, vi, 1, pp. 295–300, 3 figs., 1927.

A survey of a forest tract in the government of Tver [west Russia] showed that a number of spruce trees [*Picea* spp.] were badly rotted by a fungus which was identified as *Polystictus triqueter*. In determining the fungus, the author took into account the opinion of other mycologists who consider it to be identical with, or at most a variety of, *P. circinatus*, but the nature of the rot and the macroscopic aspect of the fruiting bodies presented such differences from those described for the latter organism as to induce him to maintain the old name. The rot frequently extended from the base of the trees to a height of 2·5 to 3 m., and was always found spreading in the lateral roots, up to a distance of 2 m. from the bole. Besides considerably injuring the quality of the timber which, even in the initial stages, is only about half as resistant to compression as the sound wood, the disease renders the trees very liable to be blown down. For both these reasons the fungus is considered to be a dangerous parasite in spruce forests. No means of control are indicated.

BOYCE (J. S.). **Decay and seed trees in the Douglas Fir region.**—*Journ. of Forestry*, xxv, 7, pp. 835–839, 1927.

In this paper an explanation is given of the widely criticized policy in the North Pacific forest district of leaving decayed trees to serve as seed in the Douglas fir [*Pseudotsuga taxifolia*] stands west of the summit of the Cascade Mountains and north of the Umpqua-Rogue River divide. It is pointed out that this system is applied only to the present over-mature stands, aged 200 to 500 years or more, and that the decays under consideration are confined to the dead heartwood and do not encroach upon the living sapwood. It has been shown [*R.A.M.*, iii, p. 115; vi, p. 385] that the heavy

losses (20 to 50 per cent.) in old Douglas fir stands are mainly due to red ring rot (*Trametes pini*), while *Polyporus schweinitzii*, *Fomes laricis*, and *F. roseus* are each responsible for a small proportion. The objection that decayed trees are likely to spread infection to future stands cannot be maintained in view of the fact that under the present system of clear cutting the trees will never attain an age at which they become liable to extensive rotting. Probably the future rotation for Douglas fir will not exceed 90 to 100 years. Throughout western Oregon and Washington the stands of second-growth Douglas firs usually show less than 1 per cent. decay of their merchantable volume, even in the presence of heavy infection. Such rotting as occurs is, moreover, mainly due to *P. schweinitzii*, which enters through fire scars.

In mixed stands of varying ages an entirely different silvicultural system should be adopted. All trees showing extensive decay at the time of cutting should be removed to prevent the spread of infection as well as to effect economy of space. The same wood-destroying fungi attack western yellow pine [*Pinus ponderosa*], lodgepole pine [*P. contorta*], sugar pine [*P. lambertiana*], Douglas fir, and western larch [*Larix occidentalis*], and it may be assumed that infection from one species is capable of spreading to all the others. On the other hand, the Indian paint fungus (*Echinodontium tinctorium*), which causes such heavy damage to white fir [*Abies concolor* and *A. grandis*] and western hemlock [*Tsuga heterophylla*], does not attack any of the foregoing except occasionally Douglas fir, while *Polyporus amarus* is confined to the incense cedar [*Libocedrus decurrens*]. Where absolutely necessary, therefore, decayed trees of these species may be allowed to remain without endangering the rest of the stand.

SALLMANN. **Das grosse Ulmensterben.** [The extensive die-back of Elms.]—*Gartenwelt*, xxxii, 4, pp. 49–50, 1928.

Writing from Kattowitz [Silesia] the author states that the die-back of elms, associated with *Nectria* sp., *Graphium* [*ulmi*], and *Verticillium* sp., continues to cause heavy damage in the streets of industrial towns. The main cause of the trouble is thought to be the inadequate supply of nourishment combined with the injurious effects of factory fumes and the like. Such a condition can only be remedied by drastic pruning of the trees and the application of garden soil and compost to the roots.

Legislación fitopatológica. [Phytopathological legislation].—*Bol. Pat. Veg. y Ent. Agric.*, ii, 5–7, pp. 61–73, 1927.

The various official regulations (originally published during 1927 in the *Gaceta de Madrid*), embodying modifications in, or supplementary clauses to, the existing Spanish phytopathological orders are here reprinted. They include provisions for the reorganization of the phytopathological service, inspection and certification of exported plants and plant products, and inspection of cultivated crops.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

APPLIED MYCOLOGY

Vol. VII JUNE 1928

Brussoff (A.). **Über das durch Bakterien verursachte Sterben der Ulmen and anderer Laubbäume.** [On the die-back of Elms and other deciduous trees caused by bacteria.]—*Mitt. Deutsch. Dendrol. Gesellsch., 1927*, pp. 244–251, 4 pl., 1927.

The author recapitulates his observations and investigations on the die-back of elms, attributed by him to *Micrococcus ulmi* [*R.A.M.*, vii, pp. 127, 286]. Pure cultures of *M. ulmi* were grown successfully on sterilized aqueous extracts of *Betula alba, Acer platanoides, Populus pyramidalis, Fraxinus excelsior, Aesculus hippocastanum*, and *Pinus excelsa*, indicating that none of the extracts contains substances toxic to *M. ulmi*, which is therefore assumed to be capable of infecting all the above-mentioned hosts under suitable conditions. Attention is drawn to the similarity between the die-back of elms and the watermark disease [*Bacterium salicis*] of white willows [*Salix alba*] in England [ibid., iv, p. 321].

Harrer. **Massenhaftes Absterben der Castanea sativa.** [Dying-off on a vast scale of *Castanea sativa*.]—*Mitt. Deutsch. Dendrol. Gesellsch., 1927*, p. 399, 1927.

Chestnuts in the gardens of the Friedrichshof Palace, Cronberg, (Taunus Mountains) [near Wiesbaden] have been dying off on a vast scale, possibly as the result of infection by *Endothia parasitica*.

Ressencourt. **Recherches sur un Oïdium du Mûrier.** [Researches on an *Oidium* on Mulberry.]—*Ann. École Nat. d'Agric., Montpellier*, N.S., xix, 2, pp. 131–158, [1927].

This article is a reprint of the author's paper already noticed from another source [*R.A.M.*, vi, p. 519].

Mounce (Irene). **Cultural studies of wood-destroying fungi.**—*Rept. Dominion Botanist for the year 1926, Div. of Botany, Canada Dept. of Agric.*, pp. 20–24, 1927.

Continuing her investigations on the defects collectively termed 'dote' of Sitka spruce (*Picea sitchensis*) used for the construction of aeroplanes [*R.A.M.*, vi, p. 265], the author states that 'white

dote' or compression shake is not associated with the presence of any fungus, and is probably due to unfavourable growth conditions, or strains.

Pieces of *P. sitchensis* sent from England as typical specimens of 'dote' showed that the term covers a number of different fungal rots. The organism most frequently isolated was *Polyporus schweinitzii* (the cause of 'conk rot' in standing trees), some of the cultures of which exhibited constant differences from the typical form, being lighter in colour, scantier in growth, and with a pronounced odour of aniseed or almonds. This species was obtained from wood which showed dark areas uniformly discoloured and becoming, in the advanced stages, dark brown and easily powdered.

An unidentified fungus was obtained from spruce affected with a pocket rot forming small areas of brown tissue which decays and becomes powdery. The organism forms a white, downy mycelium, which later becomes felted and condensed at the surface into pale yellow to deep buff velvety balls. The mycelium consists of branched, hyaline hyphae bearing numerous clamp-connexions, and, in some instances, peculiar swellings.

From Sitka spruce showing reddish-brown, easily crumbled, elongated pipes of decay with apparently sound wood between, the author isolated another unidentified fungus with a downy white mycelium, which becomes loosely matted into a pale buff velvety surface at the top. The organism eventually forms peculiar, foliose fruiting structures with hyaline spores, both on agar and on spruce wood-blocks. The hyphae are very broad, with numerous large clamp-connexions, and an abundance of hyaline chlamydospores.

As identical cultures were obtained from freshly sawn Sitka spruce in British Columbia, it is considered that the fungi were present in the timber before shipment. Their further development in transit was probably favoured by the wood being piled in damp holds and shipped through the Panama canal, where it was exposed to high temperatures. Several shipments of carefully selected aeroplane spruce sent by rail to the Atlantic coast were reported on arrival in England as so sound that 95 and 100 per cent., respectively, were fully acceptable. Kiln drying is suggested as a possible means of preventing the development of these organisms during transit.

A list is given of the cultures of wood-destroying and wood-inhabiting fungi in the mycological collection at Ottawa, where about 60 species are now represented. The identity of the European and Canadian forms of *Fomes pinicola* was established by pairing monosporous cultures of each, with the resulting formation of clamp-connexions.

HAENSELER (C. M.). **Pea root-rot studies.**—*Forty-seventh Ann. Rept. New Jersey Agric. Exper. Stat. for the year ending June 30, 1926*, pp. 334–339, 1927. [Received March, 1928.]

Further studies have been made in connexion with root rot of peas (*Aphanomyces euteiches*) [*R.A.M.*, vi, p. 523; vii, p. 306]. In 1926 infection did not take place under natural conditions until

the minimum soil temperature was 14° C. or above for a period of several days.

The following plants, in addition to garden and field peas, were infected with pure cultures of the fungus: sweet pea, hairy vetch [*Vicia villosa*], cowpea, and sweet clover [*Melilotus*].

Drying a naturally infected soil by six weeks' exposure to the direct rays of the sun under greenhouse conditions failed to destroy the root rot organism. The zoospores of *A. euteiches* may remain viable in the soil for at least four days.

The rate of transpiration of infected plants is not appreciably reduced for several weeks after infection.

The application of large quantities of hydrated lime (4,000 lb. per acre) apparently reduces infection, but smaller amounts (up to 2,000 lb.) have no inhibiting effect. Large quantities of sulphur also destroy *A. euteiches*, but at the same time they are injurious to the peas.

SCHMIDT (E. W.). **Zur Mosaikkrankheit der Zuckerrübe.** [On the mosaic disease of the Sugar Beet.]—*Ber. Deutsch. Bot. Gesellsch.*, xlv, 9, pp. 598–601, 2 figs., 1927.

The writer has found that the amount and distribution of calcium oxalate crystals in the mesophyll cells of sugar beet leaves afford an easy means of recognizing the presence and extent of mosaic disease [*R.A.M.*, vi, p. 591]. The microscopic examination of leaf sections boiled in chloral hydrate shows that the calcium oxalate cells in the white mottled zones are very small and sparsely distributed: in the yellow zones they are larger and closer together, and in the yellowish-green almost normal in size and numbers. These observations apply equally to leaves showing ordinary mottling and to those affected by mosaic. It would appear, then, that the dark green portions of the leaves are the seat of the greatest metabolic activity, expressed in the production of calcium oxalate, while in the pale, diseased areas the normal functions are disorganized.

BÖNING (K.). **Die kalifornische Blattrollkrankheit der Rübe (curly-top).** [The Californian leaf roll disease of the Beet (curly top).]—*Centralbl. für Bakt.*, Ab. 2, lxxii, 15–24, pp. 379–398, 1927.

In this paper the author discusses the chief known facts regarding the curly top of beets [*R.A.M.*, vii, p. 136] in the United States.

FAWCETT (G. L.). **El encrespamiento de las hojas de la Remolacha y el insecto transmisor.** [The curly leaf of Beet and the insect vector.]—*Rev. Indus. y Agric. Tucumán*, xviii, 5–6, pp. 61–66, 1 fig., 1927.

Details are given of the writer's experiments, under controlled conditions, in the transmission of curly top of beets by *Agallia sticticollis* [*R.A.M.*, vii, p. 3]. The positive results of these tests, together with the absence of *Eutettix tenella* from the Argentine, are regarded as conclusive proof that *A. sticticollis* is the vector of the disease in Tucumán.

Dochlenko (J. J.). **Zuckerverluste beim Aufbewahren der Rüben.** [Sugar losses in the storage of Beets.]—*Zapiski*, iv, pp. 77–86, 1926–7. [Abs. in *Centralbl. für Zuckerind.*, xxxv, 11, pp. 301–302, 1927.]

The results of systematic analyses, carried out during 1924 and 1925, showed that the sugar content of healthy stored beets was 16·5 to 17·4 per cent., with 0·02 to 0·03 per cent. invert sugar, while the acidity of the expressed juice was such that from 0·8 to 1·8 c.c. of a normal alkali solution per 100 c.c. of juice was required to neutralize it. The corresponding figures for beets infected by *Botrytis cinerea* and *Sclerotinia libertiana* [*S. sclerotiorum*] were as follows: sugar 15 to 16·6 per cent., invert sugar 0·2 to 0·85 per cent., and acidity of juice requiring 4·2 to 5 c.c. alkali for neutralization. The decayed portions contained no sugar at all.

Garbowski (L.) & Leszczenko (P.). **Zaprawianie nasion Buraczanych, jako środek walki z chwościkiem burak., Cercospora beticola Sacc.** [Disinfection of Beetroot seed, as a means for the control of leaf spot of Beet, *Cercospora beticola* Sacc.]—Reprinted from *Gazeta Cukrownicza* [*Sugar Industry Gazette*], Warsaw, *1927*, 44, 7 pp., 1927.

The results of experiments made in 1927 at the State Institute of Agricultural Science in Bydgoszcz [Poland] indicated that the incidence and severity of the leaf spot disease of beet caused by *Cercospora beticola* were noticeably reduced at the beginning of the season in plots sown with seeds that had been treated (*a*) for 15 minutes in a 0·2 per cent. solution of formalin, (*b*) for 30 minutes in a 0·5 per cent. solution of carbolic acid, or (*c*) for one hour in a 0·04 per cent. solution of annogen. The latter is described as a new proprietary preparation made in Poland, in the form of a white powder soluble in water, and is stated to be possessed of a high degree of toxicity for micro-organisms while having a stimulating effect on the seed. On the other hand, dusting the seed with slaked lime, copper carbonate, porzol, uspulun, or with a cupric dust of local preparation, did not result in any appreciable control, although a slight retardation in the development of the disease was noticed in the case of the seeds treated with copper carbonate.

In discussing these results, the authors point out that no real control of the disease can be obtained by the disinfection of the seed in areas where, as in Poland, *C. beticola* is very widespread; this point was well illustrated by the fact that towards the end of the vegetative period all the plots, whether treated or not, were uniformly infected, the infection coming both from the untreated plots and from outside the experimental grounds.

Blattný (C.). **Černání kořenů (verticillosa) Křenu.** [Black discoloration (verticilliose) of the roots of Horse-radish.]—*Zemědělský Archiv*, Prague, xviii, 7–8, pp. 363–374, 7 figs., 1927.

An account is given of a fungous disease causing a black discoloration of the inner tissues of the roots of horse-radish [*Cochlearia armoracia*], which is stated to be widespread in the eastern and central provinces of Bohemia, where this crop forms an important

item of cultivation. In its symptoms this disease is very similar to that described by Pötschke [*R.A.M.*, iii, p. 10], with the difference that no tyloses were found in the vascular bundles of the diseased roots in Bohemia. The causal organism was definitely identified as *Verticillium dahliae* [ibid., iv, p. 495], and its pathogenicity to horse-radish was proved by artificial inoculations both under laboratory and field conditions.

The disease appears to be most severe in heavy soils rich in humus, and in warm and damp years. The chief damage caused by it consists in a considerable reduction in the market value, and to a certain extent in the size, of the roots, which, on an average, are about 1 mm. thinner than the normal. In the principal centres of production in Bohemia, the disease has shown a marked tendency to increase, both in incidence and severity, of recent years, this fact being attributed to the local custom of cultivating this crop during long periods (usually from 30 to 40 years, and in some cases for over 100 years consecutively) in the same fields. Some local varieties which formerly exhibited entire immunity from the disease have been lately attacked to such an extent that two highly resistant fresh varieties have had to be introduced from Slovenia and Bavaria.

Preliminary experiments indicated that the disease is amenable to control by soil disinfection with a 2 per cent. solution of formalin at the rate of 15 l. per sq. m., and with a 10 per cent. solution of sulphuric acid at 0·5 l. per sq. m. Infection was also reduced from 90 to 50 per cent. by applications of slaked lime to the soil at the rate of 6 kg. per sq. m. Further control measures should include the removal and destruction of all infected plants, including the roots, crop rotation on a 5 to 6 years basis, good tillage of the soil, and the selection of resistant varieties of horse-radish.

DEL CAÑIZO (J.). **Medios de prevenir la 'rabia' o 'quema' de los Garbanzales.** [Methods of preventing 'rabia' or 'scorch' of Chickpea.]—*Bol. Pat. Veg. y Ent. Agric.*, ii, 5–7, pp. 10–14, 3 figs., 1927.

A brief account is given of the destructive disease known as 'rabia' or 'scorch' of chickpeas [*Cicer arietinum*], the total area under which in Spain is estimated at 250,000 hect., together with observations on the life-history of the causal organism (*Phyllosticta rabiei*) [*R.A.M.*, vii, p. 229] and directions for control. These should include the use of clean seed, which may be disinfected by five minutes' immersion in 0·5 per cent. copper sulphate; the destruction of all diseased plants immediately they are detected; and two applications of 2 per cent. Bordeaux mixture, one before and the other after flowering.

WOODFIN (J. C.). **Control of Vine diseases and pests occurring in New Zealand.**—*New Zealand Journ. of Agric.*, xxxv, 5, pp. 298–309, 4 figs., 1927.

This article gives a brief description in popular terms of the fungous diseases and insect pests of the vine encountered in New Zealand, with notes on their control. The fungous diseases dealt

with include *Oidium* (*Uncinula spiralis*) [*U. necator*], downy mildew (*Plasmopara viticola*), anthracnose (*Manginia ampelina*) [*Gloeosporium ampelophagum*], grey rot (*Botrytis cinerea*), root rot, and crown gall due to *Pseudomonas* [*Bacterium*] *tumefaciens*.

FAES (H.) & TONDUZ (P.). **Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. Rapport annuel—1926.** [Annual report for 1926 of the Federal Viticultural Experiment Station at Lausanne and Domaine de Pully.]—*Annuaire Agric. de la Suisse*, xxviii, pp. 347–371, 2 maps, 1927.

This report contains the following items of phytopathological interest. Severe outbreaks of downy mildew (*Peronospora* [*Plasmopara*] *viticola*) occurred at intervals on the vines of the Station throughout the summer of 1926. Excellent control was again given by the application of Bordeaux mixture with or without the addition of skim milk [see next abstract]. Further experiments with the causal organism of coître or livid rot of the vine (*Coniothyrium diplodiella*) showed that the pycnidia and spores retain their viability for six years. Vine shoots were attacked by *Botrytis cinerea* which, as usual, was also prevalent on the ripe grapes.

FAES (H.) & STAEHELIN (M.). **La lutte contre les parasites, insectes et champignons de la Vigne en 1925 et 1926.** [The campaign against the insect and fungous parasites of the Vine in 1925 and 1926.]—*Annuaire Agric. de la Suisse*, xxviii, pp. 373–396, 2 figs., 1927.

Neither downy mildew [*Plasmopara viticola*] nor *Oidium* [*Uncinula necator*] occurred to any extent on the vines at the Lausanne Viticultural Experiment Station in 1925, and therefore no opinion could be formed as to the relative efficacy of the various preparations tested against these diseases. In 1926, when downy mildew was extremely severe following the damp, cold spring and early summer, the best control was given by repeated applications of 2 or 3 per cent. Bordeaux mixture, preferably with the addition of skim milk to increase adhesiveness [*R.A.M.*, v, p. 649]. Neither kurtakol nor de Haën's colloidal mixture (1 or 1·5 per cent.) was equal to Bordeaux mixture in efficiency. Horst dust [ibid., vi, p. 712] used alone proved inadequate against downy mildew, but it can be recommended as a supplementary treatment between the applications of Bordeaux mixture.

Both in 1925 and 1926 'rougeot' (*Pseudopeziza tracheiphila*) [ibid., v, p. 467] was effectively controlled by weekly applications of Bordeaux mixture from 15th May until the commencement of the customary spraying against downy mildew. The causal organism appears to be highly sensitive to copper sulphate. In 1926 a severe attack of rougeot occurred in October in the Thal and Buchberg vineyards (St. Gall).

Encouraging results in the control of apoplexy or 'esca' disease [*Stereum necator*: ibid., v, p. 592] were given in 1925 by the application of a 5 per cent. solution of Schloesing's pyralion immediately after pruning in March.

RAVAZ (L.) & VERGE (G.). **La Vigne en 1926. Maladies, accidents divers, coulure, sécheresse, etc.** [The Vine in 1926. Diseases, various accidents, coulure, drought, etc.]—*Ann. École Nat. d'Agric., Montpellier,* N.S., xix, 2, pp. 81–99, 2 figs., 2 graphs, [1927].

In this review of the general situation in French vineyards, especially those in the neighbourhood of Montpellier, during 1926, the authors discuss at some length the influence of soil and weather conditions upon vine growth, notes being given *inter alia* upon court-noué [*R.A.M.*, vi, p. 334] and coulure [ibid., iii, p. 378; vi, p. 142].

In general, owing to drought, vine growth in 1926 was retarded or arrested with the result that court-noué was more serious than in 1925. It did not, however, attack fresh areas. The prevalent low temperature which adversely affected nutrition also led to important losses from coulure. Brief recommendations are made for dealing with this condition.

CHAUVIGNÉ (A.). **Étude sur la résistance des hybrides producteurs-directs aux maladies cryptogamiques en 1927.** [A study on the resistance of non-grafted hybrids to fungous diseases in 1927.]—*Rev. de Vitic.*, lxvii, 1745, pp. 325–332, 1927.

In view of the disastrous losses sustained from fungous and insect attacks in the vineyards of the western parts of central France, especially Touraine, consequent upon the unfavourable weather which prevailed between May and September, 1927, an inquiry was opened by the Indre-et-Loire Agricultural Society into the resistance shown by non-grafted hybrid vines planted in that Department, and the quality of the wine they produced [cf. *R.A.M.*, vii, pp. 219, 221].

The information collected from growers deals with a very large number of varieties. The best red hybrid was Baco 1 (23–24), everywhere described as disease-resistant even without treatment, as free from insect attack, and as giving a plentiful yield of better wine than that produced by any other non-grafted hybrid. Among white non-grafted hybrid varieties, Baco 22 A was the most satisfactory, being practically immune from mildew and brown rot [*Plasmopara viticola*] and *Oidium* [*Uncinula necator*], even without treatment. The wine produced was of very good quality.

In conclusion it is stated that all the non-grafted hybrids appeared completely refractory to vine moth [*Clysia ambiguella* and *Polychrosis botrana*] attacks which are becoming increasingly serious in the districts concerned, and were also more or less resistant to fungous diseases; even those varieties which became affected were sufficiently protected by two or three applications of copper mixtures. At present, however, few of these resistant hybrids produce wine of high quality.

HOWITT (J. E.) & COLEMAN (L. C.). **Grape diseases.**—[*ex* 'The Grape in Ontario'.] *Ontario Dept. of Agric. Bull.* 328, pp. 49–52, 5 figs., 1927.

During the past few years dead arm of the vine (*Cryptosporella viticola*) [see next abstract] has become of increasing importance

in Ontario, while black rot (*Guignardia bidwellii*) has given little trouble and may be controlled by the usual sanitary measures, supplemented by two applications of 4–8–40 Bordeaux mixture. The same treatment may be given for the control of downy mildew (*Plasmopara viticola*). Powdery mildew (*Uncinula necator*) is very severe in Ontario, especially on red-skinned varieties. Rogers vines should be dusted with sulphur, and other varieties sprayed with 4–8–40 Bordeaux mixture.

COLEMAN (L. C.). **The dead arm disease of Grapes in Ontario. A preliminary study.**—*Scient. Agric.*, viii, 5, pp. 281–315, 10 pl., 1928.

A full account is given of investigations conducted during 1926–7 into the dead arm disease of the vine (*Cryptosporella viticola*). This is the most serious and widespread vine disease in Ontario, affecting in some vineyards of susceptible varieties 11 to 50 per cent. of the plants, the only important resistant variety being Niagara.

The chief symptoms are the death of the vines or of some of their arms, stunting of leaf-bearing branches, stunting, deformation, and chlorosis of the primary leaves, and stem and arm lesions or cankers, which are associated with old pruning wounds and may appear several years before the other symptoms. The chlorotic symptoms so conspicuous in June and July are often overlooked later, as the affected leaves either drop off or are masked by the leaves borne on the secondary shoots; these, though frequently dwarfed or curled, are almost normal in colour and rarely show chlorosis.

The stem lesions may sometimes be of considerable size (up to three feet in length) and are marked when old by conspicuous zonation due to successive annual attempts to overgrow the necrotic area. The fungus invades nearly all the stem tissues, especially the medullary rays and parenchyma, and causes a wedge-shaped necrotic area extending to the centre of the wood. The tissues are much altered in the early stages, both wood and phloem being much less developed than in healthy branches, with few fibres and scarcely any lignification. The medullary rays are broad and thin-walled, the cambium inactive, and the cortex very thick. Secondary differentiation of the tissues is impeded and the structure is more like that of a herbaceous than a woody stem. Where the mycelium is active, reserve starch, which is accumulated to an unusual extent in the early stages (due probably to interference with the utilization of metabolic products), disappears and wound gum accumulates. The fungus apparently does not attack cell walls in the wood, though they become browned.

The leaf and shoot symptoms may appear at a considerable distance above the seat of the lesion and are thought to be due to the production of toxic compounds by the fungus, as well as to reduction in the food supply. Leaf bearing branches are usually free from the fungus, the symptoms in them being secondary to an infection lower down.

The perfect stage of *C. viticola* was not found in Ontario; the pycnidia, which the author regards as the main source of infection,

form abundantly near the margins of the lesions, and spores are emitted from about 1st May until September or later.

Inoculations of the stubs of cut branches with spores from pure cultures of the fungus gave positive results. In some cases germinating spores were found in the vessels below the inoculated ends.

Control consists in marking the affected parts below the lowest stem lesion in June, and removing them when pruning; pruning wounds should be sprayed in May to prevent infection from emitted spores.

RAVAZ (L.). **Chronique: Le rougeau.** [Current events. Rougeau.] —*Prog. Agric. et Vitic.*, lxxxviii, 45, pp. 441-444, 1927.

The symptoms and probable causes of the non-parasitic rougeau disease of the vine [*R.A.M.*, v, p. 467], which has been very prevalent during 1927 in those parts of France which experienced heavy rain in the spring and summer, are briefly recapitulated, and it is stated that vines grafted on Riparia and 3309 proved highly susceptible, while those grafted on Jacquez were apparently immune. Of scions, Aramon was most frequently attacked, Carignan much less so.

As healthy vines occur, either singly or in groups, in the vicinity of others badly affected, the disease is not considered contagious, but due generally to a combination of unfavourable or badly drained soil with a number of other factors which interfere with normal growth.

The susceptibility of the Aramon variety is thought to be possibly attributable to the curvature of the branches, which hinders the passage of food material from the leaves to the trunk and prolongs the vegetative period, a condition that is known to render vines susceptible to rougeau.

TIKHONEN (A. P.). Перечень болезней сельско-хозяйственных растений, а также некоторых болезней лесных пород в Брянской губернии в **1926** году. [Synopsis of diseases of cultivated plants and of forest trees in the government of Bryansk in 1926.]—*La Défense des Plantes,* Leningrad, iv, 4–5, pp. 775–779, 1928.

This is a list of the principal fungous diseases, arranged by their hosts, of cultivated plants and forest trees, which were recorded in 1926 in the government of Bryansk [south-west Russia]. Cereals suffered chiefly from *Ustilago avenae* and *Puccinia graminis,* with an incidence of 12 to 53 and 40 to 60 per cent., respectively, on oats; *P. graminis* on rye, with an incidence of 50 to 60 per cent.; and *Ustilago zeae* on maize, which in some localities infected up to 70 per cent. of the crop. None of the other diseases mentioned presented any special features.

MACLEOD (D. J.). **Report of the Dominion Field Laboratory of Plant Pathology, Fredericton, N.B.**—*Rept. Dominion Botanist for the year 1926, Div. of Botany, Canada Dept. of Agric.*, pp. 39–53, 3 pl., 1927.

Ascus and ascospore formation of *Venturia inaequalis* were

observed on old apple leaves at Fredericton, New Brunswick, on 1st and 3rd May, 1926, respectively. The first important ascospore discharge occurred on the 25th of the month, when the leaves were in the green tip stage, after which discharges continued daily until 27th July, the heaviest being on 13th July.

Scab lesions were first observed on leaves of unsprayed apple trees on 18th June, and on those of sprayed trees on 23rd June. A correlation was established between the occurrence of maximum discharges, precipitation, temperature, and sunshine.

In experiments upon the transmission of spindle tuber of potato [*R.A.M.*, vi, pp. 248, 249] it was observed that the vines or tubers only of a plant might show the disease. Vine symptoms were more pronounced in Irish Cobbler than Green Mountain potatoes. The disease was artificially transmitted by rubbing the juice of diseased plants into abrasions on healthy leaves, by juice injections into the petioles and leaves, and by aphids. Only slight tuber symptoms were noted during the first season. Under controlled conditions, infection reduced the yield in Irish Cobbler and Green Mountain potatoes by 14 and 9 per cent., respectively, during the first season, and by 36 and 29 per cent. in the second. The use of certified seed, roguing of plants showing vine symptoms, and spraying or dusting with nicotine sulphate are recommended.

A tuber rot of Green Mountain potatoes was proved by inoculations with the organisms isolated to be due to *Alternaria solani* [ibid., iv, p. 699], infection occurring only under moist conditions and at temperatures between 12° and 21° C. As some of the strains did not produce infection, it is considered that only certain strains of *A. solani* are capable of causing tuber rot.

Hollyhocks (*Althaea rosea*) were attacked by a destructive disease [the symptoms of which are described], which also affected Jerusalem artichokes, *Zinnia elegans*, and summer stock (*Matthiola incana* var. *annua*). A species of *Sclerotinia* was isolated from the lesions.

Division of Botany.—*Forty-sixth Ann. Rept. New York (Geneva) Agric. Exper. Stat. for the fiscal year ended June 30th, 1927*, pp. 31–37, 1927.

This report contains the following amongst other items of phytopathological interest.

During 1926–7, the bacterial canker [Grand Rapids] disease of tomatoes (*Aplanobacter michiganense*) [*R.A.M.*, vi, p. 272] caused severe damage in one canning-crop district in New York State. The loss to the industry from this disease was estimated at $50,000.

Three distinct species of *Ascochyta* were associated with blight of peas [ibid., vii, p. 1]. Tests showed that nearly all the pea seed harvested during 1924–26 in the western United States was free from these organisms, but much of that harvested during the same period east of the Mississippi River was infected and gave a greatly reduced crop. Treatment of diseased and healthy seed with the organic mercury dusts generally increased the stand of the plants, but this result was found largely to depend upon the soil temperature and moisture at planting time. Such treatment of diseased

seed had little or no effect in controlling the spread of *Ascochyta* blight from the seed to the above-ground parts of the plant.

One pure-line selection of cauliflower proved very susceptible to mosaic, although twenty other selections and the original variety showed normal resistance.

An experiment with Lima beans [*Phaseolus lunatus*] indicated that where bacterial rust (*Bacterium viridifaciens*) [*Bact. vignae*: ibid., v, p. 216] was present the yield was increased only when the plants were sprayed both before and after blossoming.

Division of Plant Pathology.—*Thirty-seventh Ann. Rept. Washington Agric. Exper. Stat. for the fiscal year ended June 30, 1927* (*Bull.* 222), pp. 38–43, 1927. [Received April, 1928.]

Perfect control of wheat bunt (*Tilletia tritici*) was given by three different brands of copper carbonate as well as by copper carb. Of the organic mercury dusts tested, semesan, wa-wa, and abavit B gave complete protection with both medium and heavily contaminated seed (1·3 and 3·2 gm. spores per 320 gm. seed, respectively), while Bayer dust and tutan were entirely effective with medium contamination. The untreated controls in this series showed, respectively, 48 and 25·5 per cent. from the heavily, and 15 and 3·4 per cent. from the medium smutted grain. Absolute control was given by uspulun, germisan, tillantin B, and superkalimat in liquid form, with traces of smut only for Bayer compound. The untreated controls in this series showed, respectively, 31·5 and 42·6 per cent. from the heavy, and 25·2 and 20·2 per cent. from the medium contamination. Sodium azide, used as a dust at the rate of 1 to 6 oz. per bushel, was not completely effective, but in a 0·5 per cent. solution it reduced the incidence of infection from 47·5 and 39·1 to 0·6 per cent. Medium contamination was also well controlled by the following dusts; copper phosphate (3 oz. per bushel), colloidal copper (4 oz.), hydrated copper oxide (3 oz.), porzol 55 (4 oz.), Lucas dry and magnesium Bordeaux (3 oz.), and Dupont 67 (3 oz.). Complete control of heavy contamination was given by Dupont 68, while porzol 55, vitrioline (3 oz.), and Lucas dry Bordeaux reduced infection to insignificant proportions.

Fungi belonging to 21 genera [which are enumerated] were isolated from stored apples, and two new species (which are named *Pleospora mali* and *Stemphylium congestum* but without technical description) were determined as the causes of a dark dry type of rot which advances slowly at cold storage temperatures. Blue mould (*Penicillium expansum* and other species of the genus) is the most serious rot of stored apples. It has been shown that strengths of formaldehyde from 1 in 100 to 1 in 800 will destroy blue mould in the acid of washing machines if allowed to act overnight, but action for shorter periods is not lethal at ordinary temperatures. Dry wiping of apples failed to reduce the subsequent development of the fungous flora. Storage tests showed a slight increase of rot in the Jonathan, Delicious, and Rome varieties when wiped with Andy Moe and Ideal machines as compared with unwiped stock. The same varieties, however, when dry wiped and treated with a protective coating of brogdex showed a lower percentage of infection than the unwiped.

Perennial canker of apples (*Gloeosporium perennans*) [*R.A.M.*, vii, p. 328], which was unusually prevalent in certain sections of eastern Washington during 1925–6, appears to have subsided. Serious damage to the lucerne crops was caused by wilt (*Sclerotinia trifoliorum*), especially west of the Cascade Mountains.

Blight or heart rot of beets (*Mycosphaerella tabifica*) [generally known from the pycnidial stage as *Phoma betae*] occurred in a severe form on mangels in western localities, particularly on neutral or alkaline soils.

A marked reduction in the incidence of western blight or yellows of tomato [ibid., vii, p. 282] and the similar blight of Cucurbitaceae and various ornamental plants coincided with a diminution in the prevalence of curly top of beets.

ROBBINS (W. J.). **Botany.**—[*ex* Solving farm problems by research: one year's work, Agricultural Experiment Station (Report of the Director; July 1, 1926 to June 30, 1927).] *Missouri Agric. Exper. Stat. Bull.* 256, pp. 62–63, 1927. [Received February, 1928.]

This report contains the following references of phytopathological interest. Washed mats of the living mycelium of the tomato wilt fungus (*Fusarium lycopersici*) did not shift the reaction of distilled water to the equilibrium point of P_H 5·4, the point that is obtained when washed mats are placed in buffered and unbuffered single salt solutions at different hydrogen-ion concentrations [*R.A.M.*, vi, p. 367]. Unwashed living mats also failed to shift the reaction of distilled water to P_H 5·4; in single salt solutions they gave results similar to those obtained by the addition of small quantities of the culture solution in which the mats were grown. The change in reaction in single salt solutions at different P_H values is thought to be more easily explicable on the basis of a protein analogy than by the leaching out of organic acids and salts.

Increased maize yields were secured by using nearly disease-free seed selected by means of the improved rag doll germinator method. However, when heavily infected seed was sown more densely to secure an equal stand the yields were similar. Sterilized soil inoculated with pure cultures of *Diplodia zeae*, *Cephalosporium acremonium*, *Fusarium moniliforme* [*Gibberella moniliformis*], and *G. saubinetii*, produced plants with normal healthy root systems. Unsterilized infected soil, whether untreated or given heavy applications of lime, potash, and phosphate, singly or in combination, invariably yielded plants with badly decayed root systems. Typical maize root rot symptoms were secured from sterilized infected soil and from virgin sod when inoculated with diseased maize roots. This material contained a non-septate fungus and produced oospore-like bodies resembling those described on sugar-cane and maize [ibid., vi, pp. 90, 642; vii, p. 271]. This *Pythium*-like fungus caused the development of characteristic root rot lesions on healthy maize seedlings in sterilized sand. It was reisolated in pure culture, and field experiments have been started to determine its part in the etiology of root rot.

The various species of *Fusarium* found on rotted and wilted

lucerne have been shown to be largely secondary to bacterial wilt and root rot (*Aplanobacter insidiosum*) [ibid., vi, p. 468]. Sweet clover [*Melilotus alba*] was seriously damaged in the spring of 1927 by a disease similar to the latter, but the undetermined bacterium isolated from infected material showed distinct morphological and cultural characters.

DURRELL (L. W.) & LE CLERG (E. L.). **Common diseases of Colorado truck crops.**—*Colorado Agric. Exper. Stat. Bull.* 323, 27 pp., 15 figs., 1927. [Received April, 1928.]

This bulletin gives brief popular descriptions of the most prevalent diseases of truck crops in the State of Colorado, all of which are well known in phytopathological practice. In each case recommendations are made for the control of the disease, and the bulletin terminates with a description of the preparation and application of the usual fungicides.

MAGROU (J. & Mme M.). **Radiations émises par le 'Bacterium tumefaciens'.** [Radiations emitted by *Bacterium tumefaciens.*]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 4, pp. 244–246, 1927.

After referring to the view that in stem tumours of tomato plants experimentally induced by inoculation with *Bacterium tumefaciens*, this organism exerts an action from a distance on the cells, causing proliferation [*R.A.M.*, vi, p. 149], the authors briefly describe an experiment in which part of the living root of an onion bulb was continuously washed with a current of water and exposed for three hours to a suspension of *Bact. tumefaciens* in nutrient broth held in finely drawn out pipettes at a distance of a few millimetres from the surface of the root. The root was then sectioned and the mitoses counted. An average count from nine experiments showed that the mitoses were more numerous by 26 per cent. in the area exposed to the suspension of *Bact. tumefaciens* than in the opposite side of the root; the karyokineses counted in each root amounted to thousands. Similar results were also obtained when a quartz screen 0·5 mm. thick was placed between the root and the suspension. The author therefore concludes that the action at a distance of *Bact. tumefaciens* is due to radiation and not to the liberation of a toxin.

The experiment was then repeated with eggs of the sea-urchin (*Paracentrotus lividus*) immediately after fertilization, the quartz screen again being used; after forty-eight hours the control eggs gave active larvae which were apparently normal, but the eggs exposed to the suspension gave almost motionless larvae, which were very abnormal in shape, armless, and showed a reduced skeleton.

ESMARCH (F.). **Der Bakterienkrebs und seine Bekämpfung.** [Bacterial cancer and its control.]—*Die Kranke Pflanze*, iv, 12, pp. 185–188, 1 pl., 1927.

A brief. popular account, based largely on the work of Stapp [*R.A.M.*, vii, p. 230], is given of the etiology and control of crown gall (*Bacterium tumefaciens*). Reference is made to the investigations of Blumenthal on the relation of this organism to animal

tumours [ibid., iv, p. 727], and the symptoms of the disease on some of its more important hosts are concisely described.

KAUFFMANN (F.). **Weitere Erfahrungen mit Tumefaciens-Stämmen.** [Further experiments with *tumefaciens* strains.]—*Zeitschr. für Krebsforsch.*, xxvi, 1, pp. 18–20, 1927.

Each of the three sunflower [*Helianthus annuus*] plants inoculated with the T27 strain of *Bacterium tumefaciens*, isolated from a mouse carcinoma [*R.A.M.*, vi, p. 342], developed typical tumours, one of which was twice the diameter of the stalk. T1 and Blumenthal's Hübner strain, tested on 15 and 9 plants, respectively, appear to have lost their power to cause tumours. Six strains (S1 to S6), some isolated from sunflower tumours and others from normal plants, likewise failed to produce neoplasms. These strains, though closely resembling *Bact. tumefaciens* in cultural and morphological characters, do not agglutinate *tumefaciens*- and *tumefaciens*-immune serum, and are evidently not concerned in tumour formation. On the other hand, 6 sunflower plants inoculated with *Bact. tumefaciens* and 8 with Blumenthal's P.M. strain developed characteristic neoplasms. Fifty sunflowers inoculated with 17 common pathogenic organisms [which are enumerated] gave negative results.

Attempts to endow various *tumefaciens* strains with the tumour-forming capacity by passage through carcinomata were unsuccessful.

The *tumefaciens* bacteria could only be detected in the inoculation wounds of the plants up to 11 days after the inoculation, while the macroscopic development of the tumours only commenced after three to four weeks. The bacteria could not be isolated from fully developed tumours. This phenomenon is considered to indicate that the specific bacteria initiate only the 'precancerous' stage, the subsequent growth of the tumour in the inoculated sunflower being autonomous.

PETRI (L.). **Un batterio parassita di alcune Phytophthoreae.** [A bacterium parasitic on certain Phytophthoreae.]—*Boll. R. Staz. Pat. Veg.*, N.S., vii, 4, pp. 457–464, 4 figs., 1927.

In the autumn of 1926, cultures of *Pythiacystis* [*Phytophthora*] *citrophthora* from root-rotted orange trees near Messina [*R.A.M.*, vi, p. 396] were found to be contaminated with a *Bacterium* stated to originate in the host tissues from which the mycelium of the fungus had been isolated. The contamination subsequently spread to other cultures of *Phytophthora* in the same receptacle. These were *Blepharospora* [*Phytophthora*] *cambivora* from chestnut and *P. parasitica* from Messina lemon trees. The latter resembled the *Phytophthora* isolated by Dufrénoy from root-rotted lemon trees in Corsica [ibid., v, p. 158; vi, p. 224] but differed from *P. citrophthora* in forming zoosporangia on the surface of nutrient agar, though not in mineral solutions. The zoosporangia were also of a rounder lemon shape, and sometimes were inserted laterally on the sporangiophore.

P. cambivora and *P. parasitica* were eventually freed from the *Bacterium* but *P. citrophthora* still remained contaminated in spite of repeated attempts. The *Bacterium* could not be cultured in the

absence of the mycelium of a *Phytophthora*, and the author did not succeed in ascertaining whether it was anaerobic.

Cultures of *Phytophthora* infected with this organism are easily recognized by the sparseness of the aerial mycelium. No evidence was obtained that it enters into the interior of the living hyphae, though it was found multiplying freely within dead ones. The distinctive injurious action of the organism appears to be due to the secretion of some substance that is toxic to the fungal cells.

As this *Bacterium* [the morphological and cultural characters of which are described] impedes the growth of the mycelium and may cause the death of the fungus, its parasitism is regarded as of some economic importance, especially in such slowly progressing diseases caused by *Phytophthora* as the ink disease of the chestnut and collar rot of citrus trees.

DUCOMET (V.). **Rouilles des céréales et rendement.** [Cereal rusts and yield.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 4, pp. 247–252, 1927.

In this article, the author reports an attempt to work out a method for the exact evaluation of the loss of yield caused by *Puccinia graminis* [cf. *R.A.M.*, v, p. 350].

Approximately equal numbers of ears of rusted and non-rusted wheat of the same variety are taken, and the number of grains per 100 ears of each sort is estimated; these figures are represented by A and A', respectively. The weight of 1,000 grains of each category (B and B') and that of the grain borne on 100 ears of each (C and C') is then determined. Then $\frac{A}{A'} \times 100$ denotes the percentage extent of the grain failure, $\frac{B}{B'} \times 100$, the reduction in the weight of the grain, and $\frac{C}{C'} \times 100$, the total reduction of the crop.

Thus, supposing 12 rusted and 10 non-rusted ears are collected, and the following figures obtained: $A = 175, A' = 193{\cdot}7$, $B = 45$ gm., $B' = 49$ gm., $C = 7{\cdot}875$ gm., $C' = 9{\cdot}491$ gm. Then, $\frac{A}{A'} \times 100 = 90{\cdot}5$, indicating that seeding is diminished by 9·5 per cent., $\frac{B}{B'} \times 100 = 91{\cdot}8$, showing that the weight of the grains has been reduced by 8·2 per cent., and $\frac{C}{C'} \times 100 = 82{\cdot}9$, denoting a loss in the total weight of the crop of 17·1 per cent.

Actual field results obtained by this method showed losses from *P. graminis* on wheat and oats varying from 9·5 to 19·8 per cent.

For *P. glumarum* the author recommends a method based on the preservation of a unit area of the crop from rust injury by means of repeated fungicidal treatments.

GREANEY (F. J.). **Studies on the toxicity and fungicidal efficiency of sulphur dusts in the control of some cereal rusts.**—*Scient. Agric.*, viii, 5, pp. 316–331, 2 figs., 1928.

Laboratory and greenhouse experiments [which are fully de-

scribed] to test the efficiency of two sulphur dusts, sulfodust, and the colloidal, more finely divided, kolodust, in the control of cereal rusts [*R.A.M.*, vi, p. 155; vii, p. 147] gave the following results at the Dominion Rust Research Laboratory, Winnipeg, Canada.

Both, but especially kolodust, were highly toxic in laboratory tests to the uredospores of *P. graminis tritici* and *P. graminis avenae* from wheat and oats, respectively. Under relatively dry atmospheric conditions both proved effective fungicides for long periods (up to 12 days) when applied to wheat prior to inoculation, this effect being, however, greatly reduced by high atmospheric humidity (rather more so with sulfodust), while not much affected by change of temperature. No infection occurred when wheat seedlings were dusted with kolodust immediately after inoculation with *P. graminis tritici* or *P. triticina*, but where the interval between inoculation and dusting was one day or more no control was achieved. When the sulphur was applied from one to three days after inoculation it retarded the development of the individual pustules without appreciably affecting the subsequent type of infection. When wheat and oat seedlings were inoculated with *P. graminis tritici* and *P. graminis avenae*, respectively, dusted with kolodust, and placed in moist chambers under optimum conditions for infection, it was found that the rust was satisfactorily controlled if the sulphur was applied within six hours of inoculation but that no control was obtained when it was applied 12 hours or more after inoculation. Exposure of dusted plants to artificial rain immediately after dusting markedly reduced the fungicidal action of the dusts (especially sulphodust) when the rain lasted for 15 minutes or more.

Tests made with inert dusts (china clay, chalk, and talc), having particles of similar size to those of the sulphur dusts, showed that they had no effect on spore germination and gave no control of infection with *P. graminis* or *P. triticina*, though considerable control was obtained in a parallel series of pots where sulphur was used. It is therefore considered that the effectiveness of sulphur is due to its chemical properties alone.

Emphasis is laid upon the importance of applying sulphur dusts before infection takes place and of varying the number of applications according to the weather.

Güssow (H. T.). **Canada: efforts to control Puccinia graminis tritici and P. triticina by applications of sulphur dust discharged from special aeroplanes.**—*Internat. Bull. Plant Protect.*, ii, 1, p. 4, 1928.

Preliminary experiments in the control of the stem and brown rusts of wheat (*Puccinia graminis* and *P. triticina*) in western Canada by applications of sulphur dust from aeroplanes gave such encouraging results that the trials were continued on a larger scale. There was an increase in yield of 72 per cent. in the dusted plots as compared with the controls. With the co-operation of the Royal Canadian Air Force a specially constructed aeroplane has been employed to dust 1,200 acres of No. 1 Northern and Feed wheat, but the results were not available at the time of writing.

Schulz (G.). **Der Einfluss der Düngung des Bodens auf die Verbreitung der Getreideroste.** [The influence of soil fertilization on the distribution of the cereal rusts.]—*Illus. Landw. Zeit.*, xlvii, 50, p. 637, 1927.

It is stated to be generally recognized that cereal crops following clover are particularly liable to infection by rusts [*Puccinia* spp.]. Writing in the *Sächsische Landw. Zeit.* for August, 1927, Prof. Neubauer reports that a wheat crop following clover was heavily damaged by rust and yielded only about 32 cwt. of grain per hect., while in an adjacent field the same variety succeeding potatoes yielded 60 cwt. of first-class wheat and remained free from infection. An analysis of the straw showed that the ratio of nitrogen to phosphoric acid in the field following clover was 100 : 21, the corresponding figures for the crop following potatoes being 100 : 49. This would appear to indicate that rust infection is correlated with the excessive assimilation by clover of phosphoric acid, an insufficient quantity of which is left for the wheat. The rust-reducing effect of phosphoric acid appears to be connected with the general acceleration of maturity which it induces.

Reed (G. M.). **Physiologic races of bunt of Wheat.**—*Amer. Journ. of Botany*, xv, 2, pp. 157–170, 1928.

During 1924–27 the author conducted an investigation [the results of which are tabulated and discussed] of the occurrence of physiologic races of wheat bunt (*Tilletia levis* and *T. tritici*), in the course of which evidence was obtained of the existence of at least four distinct races of *T. levis*, and six of *T. tritici* [cf. *R.A.M.*, vi, pp. 535, 542].

Race I of *T. levis* (based on material from Czecho-Slovakia) produced vigorous infection of Martin and Odessa in each of the three years of the tests; it severely infected Turkey in 1925 and 1926, and a few plants of Kanred and Hussar were infected in 1925 only.

Race II (from Vienna) caused severe infection of Kanred, Turkey, Hussar, Martin, and Odessa.

Race III (from material collected many years previously in Missouri) severely attacked Kanred and Turkey (717); Martin, however, was completely resistant, while Turkey (729), Hussar, and Odessa showed a few infections in 1925 only.

Race IV (from New York) infected Kanred and Turkey (717) but not Turkey (729), Hussar, Martin, or Odessa.

Of the races of *T. tritici*, race I (from Czecho-Slovakia) severely infected Hussar, Martin, Odessa, Kanred, and Turkey. In 1927 Turkey (717) proved resistant, but in 1925, 58·6 per cent. and in 1926, 68·7 per cent. infections, respectively, were obtained on this variety.

Race II (from New York) attacked Kanred, Odessa, Turkey, and Hussar, but in 1926–7 produced no infection of Martin, though in 1925 two out of nine plants of this variety were attacked.

Race III (from Czecho-Slovakia) attacked Kanred and Turkey (717), but proved almost innocuous to Turkey (729), Hussar, Martin, and Odessa.

Race IV (from New York) severely infected Kanred and Turkey

(717), and occasionally attacked Odessa and Hussar, but did not infect Martin.

Race V (from Vienna) attacked Kanred, Turkey (717), and more rarely Hussar, but not Martin or Turkey (729).

Race VI (from England and Wales) gave negative results on Hussar, Martin, and Odessa, and almost so on Kanred and Turkey.

CARNE (W. M.). **Grey speck disease of Wheat and Oats (known as white wilt in Western Australia).**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., iv, 4, pp. 515–519, 1 fig., 1927.

Grey speck disease [*R.A.M.*, vi, p. 578] was first identified on wheat and oats in Western and South Australia during 1927. The condition (known in the former State as 'white wilt' and in the latter as 'roadside take-all') is confined to the Great Southern Districts and appears to coincide with the distribution of brown mallet (*Eucalyptus astringens*). It occurs principally on hill-sides where ironstone gravel is associated with a light, grey, loamy soil; in less affected areas, however, the soil is almost free from gravel. It is not prevalent on wet land. Chemically the soils are poor, but have a relatively high calcium carbonate content; during summer their P_H value ranges from 6·4 to 9·5, but after the winter rains they become slightly acid.

The disease [the symptoms of which are described] appears in June or July, but unless drought supervenes, the symptoms disappear towards the end of August under Western Australian conditions, the subsequent yield being almost normal.

Good control is obtainable by the following applications (per acre): 4 to 5 cwt. iron sulphate, or 2 cwt. finely ground sulphur two months before sowing, or 72 lb. manganese dioxide with either 56 lb. sulphate of ammonia or 112 lb. iron sulphate or sulphur, at sowing time. The best results in pot experiments followed the use of manganese dioxide together with sulphate of ammonia.

Experiments which are at present being conducted by Samuel and Piper at the Waite Agricultural Research Institute, South Australia, are stated to indicate that the chief soil defect conducing to the disease is lack of available manganese.

The author has obtained some evidence that the lesions are caused by bacteria attacking plants rendered unhealthy by the defective soil conditions, and that infection results from drops of water collecting between the partly unfolded and the folded leaves of the growing tip.

As chemical treatment is locally expensive, cropping not more than once in four years is advised, pending the results of further work.

CARNE (W. M.). **Root-rot and foot-rot of Wheat. (Wojnowicia graminis and Helminthosporium sativum.)**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., iv, 4, pp. 483–488, 2 figs., 1927.

Two root diseases of wheat closely resembling take-all (*Ophiobolus graminis*) and caused, respectively, by *Helminthosporium sativum* and *Wojnowicia graminis* (which may be found at times in association with *O. graminis*) occur in Western Australia.

W. graminis (causing root rot) produces on the stem dark brown to black spots and streaks, which are partly superficial and then consist of the mycelium of the fungus, and which seldom appear above the ground. *H. sativum* (causing foot rot) is marked by dark brown streaks or patches without superficial mycelium on the stem, also not extending above the ground. Both conditions are usually unnoticed until the appearance of 'whiteheads' (premature heads without grain). Take-all and root rot are usually equally common, but foot rot is relatively rare.

During 1927, when a warm, dry period, which ended on 12th September, was followed by warm, moist weather lasting until mid-November, *W. graminis* was more common than *O. graminis* in Western Australia, where crops in some of the eastern, central, and southern areas suffered losses of 30 to 50 per cent. of the estimated yield through whiteheads, and losses of 10 per cent. were common. These two fungi were not reported from the northern parts of the State, where, though rust was common, the higher temperature apparently did not favour root diseases.

The control measures recommended are similar to those prescribed for take-all in other countries [*R.A.M.*, iv, p. 531; vi, p. 721].

WELLENSIEK (S. J.). **The nature of resistance in Zea mays L. to Puccinia sorghi Schw.**—*Phytopath.*, xvii, 12, pp. 815–825, 2 pl., 1927.

The writer's inoculation experiments, carried out at the University of Minnesota with two physiological forms of *Puccinia sorghi* [*P. maydis*: *R.A.M.*, v, p. 485] on a large number of selfed lines of maize showed that one of these lines was susceptible to one rust form and resistant to the other, while another line reacted in the opposite way. One of these physiological forms of the rust was selected for further study.

When inoculated into the resistant host, the germ-tube gave rise to an infection hypha which formed an almost spherical substomatal vesicle after penetration and then ceased to grow for about two days; in the susceptible host, on the other hand, growth continued immediately after penetration, without the formation of any resting substomatal vesicle. The development of the fungus in the resistant host was much slower and did not progress so far as in the susceptible host. Abundant spore formation occurred in the susceptible line of maize but no necrosis, whereas in the resistant host only a few spores were formed and a general necrosis of both cells and fungus followed immediately on the first appearance of the sori.

Discussing the nature of resistance, the writer considers that the experimental evidence points to a quantitative difference between susceptibility and resistance. It is suggested that the quantity in which a special nutritive substance is present determines the susceptibility or resistance of the host. The necrosis in resistant hosts may be explained by the assumption that the fungus dies of starvation and afterwards liberates a substance which destroys the host cells. This theory of a quantitative difference is supported by the existence of all possible gradations in the degree of suscepti-

bility between resistance and complete susceptibility. Physiological specialization and resistance may be regarded as two expressions of the relations between host and parasite.

A review of the work of various investigators on other rust fungi indicates a general tendency to accept the theory that toxic and anti-toxic reactions determine resistance and immunity. The writer's experiments, however, definitely point to the starvation of the fungus as the basis of resistance to maize rust.

STAKMAN (E. C.) & CHRISTENSEN (J. J.). **Heterothallism in Ustilago zeae.**—*Phytopath.*, xvii, 12, pp. 827–834, 1927.

The observations of other workers have shown the existence of sexual strains in many species of smut fungi, and further that in some cases inoculation with the sporidia of both sexes is a necessary condition of infection [*R.A.M.*, vii, p. 151].

During the summer of 1927 an attempt was made to determine the effect of inoculating Golden Bantam maize in the field with single physiological forms of *Ustilago zeae* and with combinations of two, four, and eight forms, all isolated from Minnesota material. Between 50 and 65 plants were inoculated with forms M 2, M 3, M 4, and M 7 separately, and about the same number with each of the following combinations: M 2 and M 3, M 2 and M 7, M 3 and M 4, and M 3 and M 7. It was found that no one of these forms alone caused the development of smut galls, which were produced, however, on a large percentage of plants inoculated with forms M 2 and M 3, and M 2 and M 7, while the combination of M 3 and M 4, and of M 3 and M 7 gave negative results. These results would seem to denote that *U. zeae* is heterothallic, with at least two sexes, form M 2 being of one sex and forms M 3, M 4, and M 7 of another, and that the fusion of two strains of opposite sex is necessary for the formation of smut spores in the host. The experiments were repeated in the greenhouse with the addition of forms of *U. zeae* from Mississippi, New Hampshire, and Canada, with substantially identical results.

Numerous observations were made to ascertain whether the sporidia of M 2 would fuse with those of the opposite sex, but no direct evidence of fusion was secured. However, hyphal fusions and numerous clamp-connexions were observed in the mycelium in the tissues of plants inoculated with two strains of opposite sex, while none were seen in those inoculated with unisexual strains, whether alone or in combinations of strains of the same sex.

Granting that *U. zeae* is heterothallic, the question arises whether the so-called physiological forms can really claim this designation, or whether they are merely different sexual strains. The authors consider that they can justly be termed physiological forms, since they differ from one another in appearance and biochemical reactions. Many physiological forms used in the authors' inoculation tests caused infection alone, showing that they probably comprise two morphologically similar sexual strains. It is suggested that new physiological forms of *U. zeae* are in course of production by hybridization and consequent segregation, and probably also by mutation.

Report on the Agricultural Department, Dominica, for the year ended March 31, 1927.—*Trinidad, Imper. Comm. of Agric., West Indies*, 41 pp., 1928.

In December, 1926, an outbreak of red root disease (*Sphaerostilbe*) [*repens*] of limes was reported over a very extensive area in Dominica, the condition being in part attributed to the wrenching and tearing of the roots during a gale in the previous July, to the weakening of the trees by wither-tip [*Gloeosporium limetticolum*: *R.A.M.*, vi, p. 479], and to their semi-abandoned condition on some estates. The control measures adopted proved unavailing, and in three months even the best estates became affected.

Outside the wither-tip area, the affected groves are on the low, coastal soils through which passes the drainage from the higher, diseased areas, but many cases of infection could not be explained by the wash down of spores or infected material. The disease was worst in districts with a heavy rainfall, but was also present in dry areas. Seasonal conditions do not appear to affect its prevalence.

Growers are strongly advised to plant limes budded on to sour orange stock [*Citrus bigaradia*], as this is highly resistant to red root disease.

In a New Year's message from the Agricultural Department, included as a leaflet in this report, it is stated that the adoption of the five varieties of lime previously reported as immune from or resistant to wither-tip [loc. cit.], viz., Bear's seedless, Tahiti, the Woglum lime, Everglade, and *C. aurantifolia* [from Trinidad], is inadvisable under Dominican conditions. Further experience has shown that the first two are unsuitable by reason of the brittleness of the young shoots, the third suffers badly from the blossom blight form of wither-tip, Everglade is also susceptible to wither-tip, and the raw juice of *C. aurantifolia* is unsuitable for the Dominican trade.

Citrus canker found near Fort Lauderdale.—*Monthly Bull. State Plant Board Florida*, xii, 6, pp. 130–131, 1927.

In November, 1927, an infection of citrus canker [*Pseudomonas citri*] was discovered in Florida, 79 orange and grapefruit trees being affected. About a quarter of a mile away, a small planting contained six affected lime trees. This is the first infection found in Florida since December, 1926, when two trees were attacked, the last before that being five trees in March, 1925. From October, 1923, to March, 1925, no cases were found.

Drainage in Orange and Mosambi plantations on the Deccan canals.—*Bombay Dept. of Agric. Leaflet* 20, 2 pp., 2 pl., 1927. [Received April, 1928.]

Further particulars are given concerning the control of die-back of orange and mosambi [*Citrus aurantium*] in the Ahmednagar district of Bombay Presidency by the digging of long trenches, 2 ft. in breadth by 4 ft. in depth, about 6 ft. from the trees [*R.A.M.*, vii, p. 316]. In an orchard of seven-year-old trees at Kolhar, the trenches were dug in December, 1924, and January, 1925, when the

dead branches were also removed from the trees. In January, March, and June, 1925, the following applications of manure were given per tree; (1) 4 baskets of cattle manure, (2) 1 lb. bone meal, and (3) 4 lb. castor cake, respectively. All the 475 trees recovered and the whole plantation reached the stage of heavy bearing about $1\frac{1}{2}$ years later. At the time of writing the symptoms of the disease had almost disappeared. The estimated cost of the trenches (the total length of which was 1,500 ft.) in this particular orchard was Rs. 90 [£6 15*s.* 0*d.*].

GHESQUIÈRE (J.). **Belgian Congo: a new disease of the Oil Palm (Elaeis guineensis).**—*Internat. Bull. of Plant Protect.*, i, 11, p. 169, 1927.

Oil palms (*Elaeis guineensis*) in the Equatorial Province of the Belgian Congo have recently become affected by a disease involving the decay of the collar and stem base. Progressive necrosis ensues, accompanied by a very characteristic, lageniform hypertrophy of the trunk with the emission of adventitious aerial roots above the injured parts. Affected trees are rapidly killed. The causal organism is stated to be a Basidiomycete with a white stromatic or filamentous mycelium: the fructifications have not yet been found.

ZAPROMETOFF (N. G.). **О болезнях Хлопчатника в Средней Азии в 1926 году.** [Cotton diseases in Central Asia in 1926.]—Pamphlet issued by the *Uzbekistan Plant Protection Exper. Stat.*, 9 pp., 1927.

One of the chief diseases of cotton in Russian Central Asia is stated to be the wilt caused by *Fusarium vasinfectum*. This disease, which previously had been erroneously attributed to *Neocosmospora vasinfecta* and described as collar canker [*R.A.M.*, v, p. 174; vi, p. 18], was much more widespread in 1926 than in 1925, and in some localities caused appreciable losses. Under local conditions, both in the field and under glass, it only occurs as mycelium in the host tissues, and has never been observed to form fructifications, but typical conidia and chlamydospores of *F. vasinfectum* were obtained in January, 1927, on infected roots of cotton which had been buried in soil in the preceding autumn. A brief description is given of the symptoms caused on cotton by the organism. Experiments to test whether the disease is carried by the seed gave negative results. Further experiments showed that the variety locally known as Egyptian cotton was the most resistant to wilt, closely followed by the varieties Bouz-aryk and Afifi. Observations indicated that early sown cotton was much more liable to the disease than that which was sown from the end of May onwards.

Investigations of root rot, which is also one of the major diseases of the crop in Uzbekistan, showed that in the great majority of cases it is caused by mechanical injury to the collar and stem of cotton seedlings, followed by invasion by *Penicillium glaucum* and a rod-shaped saprophytic bacterium. Inoculation through wounds with these two organisms, either singly or in association with one another, reproduced the symptoms of root rot. In some

cases, the rot was found, however, to be caused by *Rhizoctonia violacea* [*R. crocorum*], which produced symptoms hardly distinguishable from the above. In 1926, the root rot was less prevalent than in 1925, this fact being chiefly attributed to the late sowing of cotton, due to unfavourable weather conditions in the early spring of that year.

Phyllosticta gossypina was found causing a brown leaf spot of cotton in one locality of Bokhara (now renamed Kashka-Daryinskaya Region); this is stated to be the first record of this organism in Central Asia. Its morphology entirely agreed with Saccardo's diagnosis of the fungus, which hitherto has been only known to occur in North America.

PULSELLI (A.). **Ricerche sulle formazione e la natura del pigmento della Microcera coccophila.** [Investigations into the formation and nature of the colouring matter in *Microcera coccophila*].—*Boll. R. Staz. Pat. Veg.*, N.S., vii, 4, pp. 436–447, 1 fig., 1927.

A full account is given of the author's further investigations into the coloured colonies of *Microcera coccophila* obtained on different media [*R.A.M.*, vii, p. 166], and the conclusion is reached that the formation of colouring matter in the mycelium of the fungus is provoked by the action of diffused daylight upon cultures which have grown in the dark, while the pigmentation of the conidia is a fixed characteristic unrelated to environment and due to the genetic constitution of the species.

The colouring matter is considered to be a lipochrome closely related to, if not identical with, that of other Hypocreaceae.

BUTLER (J. B.) & BUCKLEY (J. J. C.). **Catenaria anguillulae as a parasite of the ova of Fasciola hepatica.**—*Scient. Proc. Roy. Dublin Soc.*, xviii (N.S.), 45, pp. 497–512, 4 pl., 1927.

In this paper the authors record the presence of the Chytridiacean fungus *Catenaria anguillulae* in the living ova of the common liver fluke of sheep (*Fasciola hepatica*). The ova had been kept for some months in tap water from a reservoir, and this water is regarded as the source of infection. The strain of the fungus in *Fasciola* differs from published descriptions of *C. anguillulae* in the larger dimensions of the sporangia and in its habitat.

C. anguillulae is usually found in the eggs as a chain of two or more sporangia connected by septate hyphal isthmuses. Nutritive rhizoids are also present. In a single ovum there may be from one to thirty round, oval, or irregular sporangia, the average diameter of which is 15 μ but which may be up to approximately 130 by 50 μ.

The zoospores are discharged through a cylindrical dehiscence beak, 20 to 500 μ in length, which usually has a globose enlargement at the base. This beak normally pierces the wall of the ovum, but sometimes emerges through the operculum. The number of zoospores varies from about 40 to 700; they measure 6 to 7 by 4 to 5 μ, and possess a single posterior cilium, a vacuole, and a mass of deeply staining granules. They remain active for from fifteen minutes to seven hours.

Infection takes place by a zoospore settling on the shell of the ovum, where it forms a subspherical cell wall and then emits a germ-tube which obliquely pierces the shell, forming an aperture approximately 0·5 μ in diameter. Penetration takes place within twelve hours from the settling of the zoospore, the empty cell wall of which remains visible on the surface of the ovum for a considerable time. After entry the contents of the zoospore swell up to form a subspherical cyst, from which a mycelial filament grows into the substance of the ovum, developing variously shaped swellings which become sporangia. The unswollen parts of the mycelium develop septa, and form isthmuses between the sporangia. The nutritive rhizoids, which may branch, arise usually from the sporangia but occasionally from the isthmuses. Liberation of the zoospores occurs not less than four days after entrance, but may be considerably later.

C. anguillulae can be cultivated easily at laboratory temperature in test-tubes containing dead or living ova in tap water; very many of the ova become infected under these conditions. No form of sexual reproduction was observed, nor were resting spores found.

The ova of *F. hepatica* live and hatch out into miracidia after nine months at laboratory temperature, but in no instance were miracidia formed from eggs infected with *C. anguillulae.*

A bibliography of 8 titles is appended.

De Magalhães (O.) & Neves (A.). **Contribuição ao estudo das tinhas. Trichophyton multicolor n. sp.** [Contributions to the study of the ringworms. *Trichophyton multicolor* n. sp.] —*Mem. Inst. Oswaldo Cruz,* xx, 2, pp. 271–298, 12 pl. (2 col.), 1927. [French translation. Received April, 1928.]

In August, 1922, a species of *Trichophyton* was isolated from the scalp of a white boy at Rio de Janeiro. It was allied to *T. cerebriforme* and *T. plicatile* [*R.A.M.*, vi, p. 484; vii, p. 170], from which it differed, however, in the polychromatic pigmentation of the cultures and in other particulars. In coloration the new species (which is named *T. multicolor*) resembles *T. rosaceum*, *T. vinosum*, *T. ochraceum*, and *T. equinum*, but it is readily distinguishable from these species by various physiological and morphological characters which are detailed. Inoculation experiments with *T. multicolor* on guinea-pigs gave positive results.

Stokes (W. R.) & McCleary (S.). **A case of pulmonary mycosis.** —*Boston Med. & Surg. Journ.*, cxcvii, 29, pp. 1350–1353, 3 figs., 1928.

The autopsy on a 15-year-old coloured boy who died in December, 1924, after a six weeks' illness, revealed extensive tuberculous peritonitis and an acute fibrinous pleurisy of the lower right lung, which on section showed scattered areas of consolidation. Part of the connective tissue of the lung was necrotic, as was also an adjacent bronchus in which was found a fungus showing the characteristic morphology of an *Aspergillus* or *Penicillium*, the branching mycelium of which ended in a number of hyphae penetrating the necrotic bronchial wall and peribronchial tissue. The

pleural surface of the lower lobe was covered with a very thick necrotic layer, the air-cells, especially near the bronchi, were filled with an exudate of fibrin, leucocytes, and epithelial cells, and there was active congestion of the smaller blood-vessels. The bronchi contained a purulent exudate.

It would appear from a study of this case that the bronchial infection was exclusively due to the above-mentioned fungus, the exact classification of which was impossible in the absence of cultures.

PINOY (P. E.) & NANTA (A.). **Sur l'existence fréquente d'une mycose de la rate en Algérie.** [On the frequent occurrence of a mycosis of the spleen in Algeria.]—*Comptes rendus Acad. des Sciences*, clxxxiv, 6, pp. 347–348, 1927.

In a case of splenomegaly in Algeria in which 'nodules of Gamna' were present, the authors found that the cysts were composed of fructifications of *Sterigmatocystis* [*Aspergillus*] *nidulans*. Eight other similar cases were encountered, thus establishing that this type of splenomegaly is really a mycetoma caused by this fungus. The latter may penetrate either through skin lesions or through the digestive tract, and may open the way to secondary infections with various bacteria which then modify the clinical aspect of the disease.

NANTA (A.). **Une mycose splénique. Étude histologique.** [A splenic mycosis. Histological study.]—*Ann. d'Anat. Path. et d'Anat. Normale*, iv, 6, 1 col. pl., 3 figs., 1927. [Abs. in *Trop. Dis. Bull.*, xxv, 2, p. 165, 1928.]

Out of fifteen human cases operated on for splenic anaemia in Algeria, three spleens were found to contain, in addition to bacteria, nodular lesions and a fungus which, in pure culture, proved to be a species of *Sterigmatocystis* [*Aspergillus*: see last abstract].

ÉMILE-WEIL (P.), GRÉGOIRE (R.), & FLANDRIN (P.). **La splénomégalie mycosique.** [Mycotic splenomegaly.]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris*, 3rd Ser., li, 17, pp. 713–717, 1927. [Abs. in *Trop. Dis. Bull.*, xxv, 2, p. 163, 1928.]

The authors report that cases of chronic splenomegaly of mycotic origin are frequent in France, especially in Paris, where seven out of sixteen spleens examined yielded on isolation a fungus that grew readily on Sabouraud's medium and appeared to be a species of *Aspergillus* [? *A. nidulans*: see preceding abstracts]. Clinical diagnosis of the condition is not possible. The infected spleens weighed from 1 to 2 kg. and usually contained characteristic yellowish-brown nodules about the size of a millet grain.

SCHWEIZER (A.). **Ueber ägyptische Splenomegalie.** [Egyptian splenomegaly.]—*Schweiz. Med. Wochenschr.*, lvii, 43, pp. 1017–1027, 7 figs., 1927. [Abs. in *Trop. Dis. Bull.*, xxv, 2, pp. 165–166, 1928.]

In three human cases operated on for Egyptian splenomegaly, the author found in the spleens fibrous granules containing fungous

hyphae, which were frequently enclosed in giant cells, and from which swollen and segmented hyphae often extended into the surrounding tissues. None of the spleens contained any other parasitic organisms. From these observations the author concludes that some cases of Egyptian splenomegaly are, like those described by Weil from Algeria, of mycotic origin [see preceding abstracts].

OBERLING (C.). **Le rôle pathogène de la mycose splénique de Nanta.** [The pathogenic rôle of Nanta's splenic mycosis.]—*La Presse Méd., 1928*, 1, pp. 2–3, 1928.

The author's studies on 24 cases of splenic mycosis associated with *Aspergillus nidulans* [see preceding abstracts] have led him to conclude that the fungus plays only a subordinate part in the etiology of the disease, the true cause of which is still obscure.

DOWSON (W. J.). **Some fungus diseases of bulbs.**—*Journ. Roy. Hort. Soc.*, liii, 1, pp. 45–54, 1928.

After a brief, popular account of the nature of fungous infection and of the life-history of fungi (especially *Botrytis* and *Sclerotium* spp.), the symptoms of the following diseases of bulbs are described. Fire of tulips (*B. tulipae*), which the author regards as identical with *B. parasitica* [*R.A.M.*, vi, p. 510]; 'smoulder' of narcissus (*B. narcissicola*), which has also been found to attack snowdrops at Wisley (Surrey); fire of narcissus (*B. polyblastis*) [ibid., v, p. 740]; *B. galanthina* on snowdrops; mould of lilies, characterized by the presence of round orange-brown or buff spots on the leaves, and caused by a species of *Botrytis*, possibly *B. cinerea*, which has recently been found also on Spanish and other bulbous irises; grey bulb rot of tulips and *Iris reticulata* (*S. tuliparum*) [ibid., v, p. 557]; neck rot and white rot or mouldy nose of onions (*B. allii* and *S. cepivorum*, respectively); and dry rot of gladioli (*S.* sp.) [ibid., v, p. 430].

Flower garden calendar chiefly of annuals.—*Bermuda Dept. of Agric. Bull.*, 22 pp., 1927.

In this bulletin, compiled by members of the Bermuda Garden Club and edited by the Director of Agriculture and Mr. Lawrence Ogilvie, the Plant Pathologist, notes are given on the majority of diseases and pests affecting flowering annuals in Bermuda. The list includes damping-off of seedlings (*Rhizoctonia* [*Corticium*] *solani*) and wilting of larger plants (*Sclerotinia sclerotiorum*), both of which attack a number of garden flowers; *Sclerotium rolfsii* on violets; sweet pea root rot (? *Bacillus lathyri*); and aster (*Callistephus chinensis*) yellows [*R.A.M.*, vi, p. 667], which also affects many other flowers in Bermuda, including chrysanthemum, *Coreopsis*, *Cosmos*, *Calendula officinalis*, *Gypsophila elegans*, *Helichrysum bracteatum*, *Phlox drummondi*, *Scabiosa atropurpurea*, and *Zinnia elegans*.

SIBILIA (C.). **Osservazioni su un fungo parassita di un Orchidea.** [Observations on a fungus parasitic on an Orchid.]—*Boll. R. Staz. Pat. Veg.*, N.S., vii, 4, pp. 412–435, 8 figs., 1927.

From brown spots on the leaves and pseudo-bulbils of a species

of *Laeliocattleya* the author isolated a fungus which he names *Diplodia laeliocattleyae* n. sp., and of which he gives a Latin diagnosis. The pycnidia in culture are united in groups in a pseudoparenchymatous stroma and contain paraphyses in addition to the pycnospores. A distinct section, *Nematodiplodia*, is suggested for species of *Diplodia* containing paraphyses (a list of which is given) in contradistinction to those that have none, for which the name *Eudiplodia* is proposed.

The conidia are hyaline and continuous at first and later turn dark and become uniseptate. In both stages they germinate readily. In young cultures, especially, dark hyphae are found in the mycelium, having short, thickened, spheroidal or ellipsoidal chlamydospores arranged in chains, or singly. The fungus [full cultural details of which are given] grows best in media at a reaction of P_H 4·6; no organs of propagation were formed in culture at P_H 8·2.

ESMARCH [F.]. **Ein neuer Blattpilz an Sarracenien.** [A new leaf fungus on Sarracenias.]—*Die Kranke Pflanze*, iv, 12, pp. 196–197, 1927.

A brief, popular description is given of a hitherto apparently unknown disease of the American insectivorous plants, *Sarracenia purpurea* and *S. rubra*, which are occasionally cultivated under glass in Germany. The sheath leaves show a reddish, later brownish discoloration and are covered with the minute, black pycnidia (200 μ in diameter) of a species of *Phyllosticta*, containing numerous hyaline, unicellular, oval to fusiform spores, measuring 6 to 9 by 3 μ. The fungus, which has been named *P. sarraceniae*, persists in the remnants of the foliage occurring in the potting soil, and is conveyed from leaf to leaf by watering. Affected leaves should be destroyed as soon as possible and the potting soil renewed.

WOLF (F. A.). **Blight of Asparagus Fern.**—*Journ. Elisha Mitchell Sci. Soc.*, xliii, 1–2, pp. 91–96, 2 pl., 1927.

A blight of *Asparagus plumosus* characterized by a drying and premature shedding of the branchlets, and, in severe attacks, by the destruction of the short branches at the crown, is widely prevalent in Florida, where this crop is of some commercial importance.

The causal organism [the morphological characters of which are briefly described] was identified by Dr. C. L. Shear in its pycnidial stage as *Ascochyta asparagina* Petrak, with the diagnosis of which it agrees satisfactorily, except that the pycnidia measure 90 to 150 μ in diameter, whereas in Petrak's fungus on *Asparagus officinalis* they are given as 170 to 280 μ. This stage is found on recently killed stems and is followed by an ascigerous stage on the decaying stems, which was identified as *Didymosphaeria brunneola* Niessl. The pycnidial stage was obtained in culture from the ascospores.

Inoculations of young asparagus ferns free from blight with a suspension of the conidia from pure cultures caused characteristic symptoms of the disease.

Satisfactory control was obtained by frequent applications of Bordeaux mixture 1–1–80.

NEUWEILER (E.). **Switzerland: a new Red Clover disease.**—*Internat. Bull. Plant Protect.*, ii, 1, p. 2, 1928.

Dead and dying red clover (*Trifolium pratense*) plants observed during the spring of 1927 at Strickhof (Zürich) and elsewhere, were found to be infected by *Fusarium trifolii*, the hyphae of which partially obstructed the vascular bundles of the discoloured root tissues. Clover plants inoculated with a pure culture of the fungus died in a few weeks, while control stems on the same stock remained healthy. Nematodes were shown to assist in the dissemination of the disease. Hitherto the wilt caused by *F. trifolii* has been known only in Russia, where it is stated by Jaczewski to be spreading considerably.

HULSENBERG [H.]. **Schwere Schäden bei Luzerne durch Macrosporium sarcinaeforme Cav.** [Heavy damage to Lucerne caused by *Macrosporium sarcinaeforme* Cav.]—*Deutsche Landw. Presse*, liv, 51, p. 716, 1927.

In July, 1926, and again in the autumn of 1927, the writer observed that the lucerne crops in the Querfurt district [Saxony] were severely attacked by *Macrosporium sarcinaeforme* [the symptoms and life-history of which are briefly described: *R.A.M.*, v, p. 233], which spread with remarkable rapidity. Infection was particularly heavy on catch crops growing in soils which were deficient in carbonate of lime. It is recommended that caustic lime should be applied previous to sowing in the autumn or early spring at the rate of 20 cwt. per hect. for the Loess clay soils of the affected areas. No differences in varietal susceptibility were noticed between Provence, Hungarian, and Thuringian lucerne. Red clover growing among severely diseased lucerne remained practically immune.

SCHWARZ (M. BEATRICE). **Eenige ziekten van onbekenden aard bij groenbemesters.** [Some diseases of unknown origin on green manures.]—*Korte Meded. Inst. voor Plantenziekten* 5, 19 pp., 11 figs., 1927. [English summary.]

Descriptions are given of the following obscure diseases of economic importance occurring in green manures in Java. *Crotalaria anagyroides* and *C. juncea* are liable to a disorder known as witches' broom or curly disease ('krulziekte'), characterized in both species by an unusual development of erect side shoots from the dormant buds of the stem, the formation of abnormally small, pale green leaves, and poorly developed pods. In *C. anagyroides* growth is reduced, while in *C. juncea* it is increased so that the plants are much taller than normal. The very weak seedlings that develop from the seed of affected plants die before they reach a height of 50 cm. Owing to this disease, which occurs in Buitenzorg, Cheribon, and elsewhere, the cultivation of this crop has been abandoned in some districts. In the 'krulziekte' [rosette: *R.A.M.*, vii, p. 13] on groundnut (*Arachis hypogaea*), which is found in a few localities of Java, e.g. Kediri, the condition also resembles a witches' broom.

The last disease appears to be associated with certain types of soil.

C. anagyroides also suffers from crinkle disease ('kronkelziekte'), first observed at Buitenzorg in 1926. The base of the plant may be normal but near the top it becomes curved and rumpled in a characteristic manner, the affected parts being darker green than normal and bearing few and poor seeds. The veins on the under side of the leaflets are thickened and dark green, while the diseased branches are also thicker than healthy ones. Some marked abnormalities were detected in the anatomical structure of crinkle stalks, including a reduced development of the vascular tissues, absence of bast fibres, poorly developed and collapsed sieve-tubes, fewer layers of cortical parenchyma, and an increase of the chlorophyll content. Neither fungi nor bacteria were found in diseased plants, and attempts at insect transmission gave negative results.

Curly disease ('krulziekte') of *Calopogonium mucunoides* was first noticed at Buitenzorg at the beginning of the east monsoon in 1926. The leaves of affected plants were rolled, abnormally small, and pale, and little seed was produced. There was no indication of a witches' broom formation, the condition being more of the leaf roll type. The disease rapidly spread over the entire plantation with disastrous results, and has also been reported from Lembang. In the absence of fungi, bacteria, and nematodes, it is thought that the condition may be due to a virus, possibly transmitted by the bugs *Chavliops bisontula* and *Halictus tibialis.*

BRITON-JONES (H. R.) & LEES (A. H.). **The correct time for application of spray fluids.**—*Journ. Min. Agric.*, xxxiv, 9, pp. 814-817, 8 pl., 1927.

In order to assist growers to determine the exact stage at which the spraying of fruit trees should be carried out, the authors have drawn up a spray calendar for apple, black currant, cherry, gooseberry, peach, pear, and plum, numerous photographs showing the different stages in the growth of the tree, as illustrated by the young shoots, when the various sprays should be given. The stages illustrated are named and defined as follows: dormant, no sign of bud; swelling, bud scales separated, but no green shows; bursting, the bud has opened and shows green leaf or flower rudiments; burst, the stage after bursting; green flower, a stage in apples and pears in which the trusses show but no petal colour is seen; pre-flowering or pink, immediately before the flower opens. The term pink in this last stage applies to apples only.

Vierte Tagung betreffend die Bekämpfung von Krankheiten und Schädlingen der Obstbäume, an der Schweiz. Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil. [Fourth conference in connexion with the control of diseases and pests of fruit trees at the Swiss Experiment Station for Fruit Growing, Viticulture, and Horticulture at Wadenswil.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, lxiii, 26, pp. 445–536, 34 figs., 2 graphs, 2 diags., 1927.

This report of the various experiments carried out at Wadenswil (Zürich) in 1927 contains a number of interesting items in connexion

with the control of fungous diseases of fruit in Switzerland. Apple and pear scab [*Venturia inaequalis* and *V. pirina*: *R.A.M.*, v, p. 497] were well controlled by two or three applications of Siegfried lime-sulphur (1 in 30). Marked varietal differences in the response to treatment were observed. *Mycosphaerella sentina* on pears was also completely arrested by treatment with lime-sulphur 1 in 40. This preparation was further moderately successful against shot hole of cherries [*Clasterosporium carpophilum*]. Leaf spot of quinces (*Entomopeziza soraueri*) [*Fabraea maculata*] refused to yield to treatment with lime-sulphur, but both this disease and *Sclerotinia cydoniae* were controlled by one winter (5 per cent.) and three summer applications (1⅓ per cent.) of Bordeaux mixture.

JUNGE (E.). **Zweckmässige Schädlingsbekämpfung sichert dem Obstbau wirtschaftliche Erfolge.** [Systematic pest control ensures the commercial success of fruit growing.]—*Obst- und Gemüsebau*, lxxiv, 1, pp. 8–9, 3 figs., 1928.

Details are given of the operations conducted at the Geisenheim (Rhine) Research Station in connexion with the systematic campaign for the control of insect and fungous pests pursued in 1927. Apple and pear scab (*Fusicladium*) [*Venturia inaequalis* and *V. pirina*] were well controlled by one to three applications of 1 per cent. Bordeaux mixture. Nosprasen gave very satisfactory results in the combined control of scab and insect pests. A significant increase of yield in the Baumann's Reinette apple variety was obtained by one application of 1·5 per cent. nosperal on 4th March, followed by two of 1·5 per cent. nosprasen on 9th and 21st May.

VAN POETEREN (N.). **De schurftziekte bij Appel en Peer.** [The scab disease of Apple and Pear.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 50, 24 pp., 3 pl., 1927.

The symptoms of apple and pear scab (*Venturia inaequalis* and *V. pirina*) are described and notes are given on the life-history of the causal organisms, their effects on the hosts, the circumstances influencing their development, and their control by the application of standard fungicides at suitable periods. Under Dutch conditions the most susceptible apple varieties are Cellini, Cox's Pomona, and Signe Tillisch, while among pears the Beurré d'Amanlis, Beurré Six, Conseiller à la Cour, Juttepeer, Louise bonne d'Avranches, and Nouvelle Fulvie are particularly liable to infection.

FISHER (D. F.) & BROOKS (C.). **Apple water-core theories revised.** —*Better Fruit*, xxii, 6, pp. 5, 21, 1927; 7, pp. 14, 15, 22, 24, 26, 1928.

The results of the authors' experiments on the water-core disease of apples which were begun at Wenatchee, Washington State, in 1919, and a popular account of which is given in the present paper, have already been noted from another source [*R.A.M.*, v, p. 433.]

Day (L. H.). **Pear blight treatment amplified.**—*Better Fruit*, xxii, 7, pp. 20–21, 1928.

A zinc chloride solution (6 lb. of dry zinc chloride to 1 gall. of the solvent) weaker than that which the author previously recommended [*R.A.M.*, vii, p. 180] for the treatment of pears affected with blight [*Bacillus amylovorus*] should be used in California from April to June for smooth-barked branches less than 2 in. in diameter, roots and lower parts of the trunks of trees less than 9 years old, roots less than 4 in. in diameter, and the upper parts of the trunks of trees less than 4 years old.

During the remainder of the year the use of the weaker solution is also indicated for smooth-barked branches under 4 in. in diameter, roots and lower parts of the trunks of trees less than 9 years old, the upper parts of trunks and crotches of trees under 6 years of age, roots of less than 4 in. in diameter, and all dormant and slowly active cankers. If the stronger solution proves too penetrating, the weaker should be used on branches up to 3 in. or more in diameter, and also on old cankers, even if active, when it is uncertain whether sufficient cambium remains to ensure recovery.

Italy: phytopathological notes.—*Internat. Bull. Plant Protect.*, ii, 1, p. 1, 1928.

A deterioration of Passe Crassane pears (growing and stored) during November, 1927, has been reported from the Turin Phytopathological Observatory. The causal organism has been identified as *Macrosporium epicarpium* McAlp., found in South Australia. This fungus is stated to be probably the same as [the later recorded] *M. sydowianum* Farneti.

Phyllosticta briardi Sacc., previously known to occur in France, was determined on apple leaves at the same station.

Birmingham (W. A.). **Burr-knot or stem-tumour of Quince and Apple trees.**—*Agric. Gaz. New South Wales*, xxxviii, 12, pp. 941–943, 2 figs., 1927.

Burr-knots are stated to be more common on quince than on apple trees in New South Wales, and are considered to be aggregations of dormant aerial or adventitious roots [*R.A.M.*, v, p. 166]. There is no evidence that they have any detrimental effect upon the tree.

'Reversion' in Black Currants.—*Min. of Agric. Leaflet* 377 (revised 1927), 10 pp., 2 pl., 1927.

This leaflet gives a popular account of reversion of black currants, which appears to have been recorded in Holland and Germany as far back as 1904; in England it first came into prominence in 1912, but it is thought probable that it had already been established for a few years. The part of the leaflet dealing with the symptoms and the cause of the disease has already been noticed from other sources [*R.A.M.*, vii, p. 182 *et passim*]. Control should consist in the eradication and destruction by fire of all reverted bushes, and all measures directed towards the suppression of the insect vectors, one of which is stated to be the big bud mite [*Eriophyes ribis*].

Care should also be taken to select cuttings for new plantations from healthy bushes not over five years old.

STEUP (E.). **Die Rutenkrankheit der Himbeere in Dänemark und ihre Bekämpfung.** [The cane disease of the Raspberry in Denmark and its control.]—*Obst- und Gemüsebau*, lxxiii, 24, pp. 377–378, 1927.

This is a translation of a paper by Miss A. Weber in the Danish periodical 'Haven', Part 9, 1927. Cane blight of raspberries (*Didymella applanata*) [*R.A.M.*, vi, p. 739] is stated to be widespread in Denmark, occurring chiefly in August and September. The symptoms of the disease are briefly described and indications given for its control by cultural measures. The Superlative, Marlboro, and Goliath varieties have been found particularly susceptible, while Fajstrup and Empress Dagmar are resistant.

POOLE (R. F.). **A variety of Collybia dryophila parasitic on Dewberry.**—*Journ. Elisha Mitchell Sci. Soc.*, xliii, 1–2, pp. 101–104, 3 pl., 1927.

A detailed morphological description is given of the fruit body, developed in pure culture but not yet found in nature, of the parasitic strain or variety of *Collybia dryophila* which the author has recently described as causing a root rot of Lucretia dewberry [*Rubus procumbens* var. *roribaccus*] in North Carolina [*R.A.M.*, vii, p. 184].

WARDLAW (C. W.). **The Lanarkshire Strawberry industry. Recommendations for the treatment of diseased fields, and for effecting improvement in the cultivation of the Strawberry.**—53 pp., Glasgow, R. MacLehose & Co., 1928.

In this paper the author describes in a popular form the results of his two years' studies in connexion with the Lanarkshire strawberry disease (associated with *Pythium de Baryanum* and other fungi) [*R.A.M.*, vii, p. 253], and gives full directions for its control by improved methods of cultivation. The use of the highly susceptible Ruskin variety should be discontinued. [Some of the biological details of this work are reproduced in the *Scottish Journ. of Agric.*, xi, 1, pp. 65–71, 1 pl., 1928.]

PETRI (L.). **Esperienze sopra alcuni mezzi di disinfezione delle Castagne destinate all' esportazione.** [Experiments on some methods of disinfecting Chestnuts destined for export.]—*Boll. R. Staz. Pat. Veg.*, N.S., vii, 4, pp. 388–411, 2 figs., 1 diag., 1927.

In 1922, chestnuts exported from Italy to the United States were found on arrival to be heavily infected with *Penicillium* spp. (probably associated with defective storage in transit and high moisture content); more recently, treatment for insect attack (*Carpocapsa* [*Cydia*] *splendana* and *Balaninus* sp.) by the immersion of chestnuts in water at 15° C. for six days led to the development of moulds, chiefly *P. glaucum*, in diseased chestnuts not containing larvae, and of wet rot due to the putrefaction of the dead larvae in others.

Tests of other methods of destroying these insects have therefore been carried out at the Royal Station of Vegetable Pathology at Rome. The results indicate that hydrocyanic acid gas is effective, and details are given of a vacuum apparatus that has been satisfactorily employed for the purpose.

OGILVIE (L.). **Damping-off.**—*Agric. Bull. Dept. of Agric. Bermuda*, vi, 12, p. 3, 1927.

Most of the damping-off of seedlings in Bermuda has recently been shown to be caused by one or more strains of *Rhizoctonia* [*Corticium*] *solani* apparently distinct from that responsible for the ordinary stem and tuber rot of potatoes, which has not yet been observed in the Colony. The fungus is often found on flower seedlings in boxes (e.g., *Gypsophila*) and commonly causes the symptoms of 'wire stem' on cabbage and cauliflower seedlings [*R.A.M.*, iv, p. 518]. The same or a similar organism has also been found in Bermuda in association with brown patch of turf [ibid., v, p. 742], a rot of bamboo tips, a stem rot and wilt of carnations, and brown stem lesions of lilies. Affected plants should be removed and their healthy neighbours treated with uspulun at the rate of 1 oz. to 3 galls. of water.

ABT (G.). **L'épilage par les enzymes de moisissures.** [Depilation with mould enzymes.]—*Cuir Tech.*, xvi, 23, pp. 514–519, 2 figs., 1927.

Numerous moulds, including *Aspergillus oryzae*, *A. effusus*, *A. parasiticus*, *A. ochraceus*, and *A. flavus*, secrete a proteolytic enzyme capable of depilating skins. An infusion of dried *A. oryzae* will complete the process in a few hours. The protease is active at lower temperatures than pancreatin, satisfactory results being obtained at 20° to 30° C. The optimum hydrogen-ion concentration for the activity of the enzyme is about P_H 8. Pre-treatment of the skins with dilute NaOH greatly accelerated the action of the enzyme. The addition of a weak antiseptic to the infusion is advisable to retard the growth of bacteria. Borates are effective for this purpose. Skins depilated with *A. oryzae* have yielded excellent leather. The technical and economic aspects of this process are discussed.

HERTZSCH (W.). **Beiträge zur infektiösen Chlorose.** [Contributions to infectious chlorosis.]—*Zeitschr. für Bot.*, xx, 2–3, pp. 65–85, 20 figs., 1927.

The writer's observations and transmission experiments [which are fully described] have clearly demonstrated that there are two distinct types of infectious chlorosis in the Malvaceae, which are termed *A* and *B*, the former exemplified in *Abutilon striatum thompsoni* and characterized by a yellow spotting of the leaves and a yellow coloration of the veins, and the latter found in *A. darwini tesselatum* and characterized by pale green spots and stripes on the foliage, the veins being mostly green.

The *A* type of infectious chlorosis of the Malvaceae is stated to have first appeared in a single plant of *A. striatum* imported into England from the West Indies in 1868. The variegated strain

propagated from this plant became known as *A. striatum thompsoni*. Later on, it was discovered that the variegation could be transmitted to other Malvaceae by grafting, but it is not transmissible through the seed, nor was the author able to secure infection by means of the expressed sap of variegated plants. Natural transmission from affected to healthy plants has not been observed.

The origin of the *B* type is unknown, but it is thought to have probably appeared spontaneously in *A. darwini*.

A. indicum and *Sida napaea* suffer so severely from the *A* type that the formation of chlorophyll in the leaves ceases almost entirely. Other Malvaceae showing a greater or lesser degree of susceptibility to this type of infection are *A. sellowianum*, *Malva borealis*, *M. crispa*, and *Althaea officinalis*. *Lavatera arborea*, which is immune from the *A* type, is highly susceptible to *B*, the leaves being entirely deformed and rapidly dying as the result of failure of the assimilatory functions. *Sphaeralcea umbellata*, *Sidalcea atropurpurea*, and *Althaea taurinensis* are immune from both types of infectious chlorosis. A plant of *Abutilon striatum* already infected by type *A* readily contracted the symptoms of type *B*, but it was not possible to test the other susceptible species for their reaction to double infection, though *A. indicum*, *A. sellowianum*, *M. borealis*, *M. crispa*, and *Althaea officinalis* are susceptible to both forms.

Some further instances of infectious chlorosis in *Euonymus*, *Jasminum*, *Fraxinus*, *Castanea*, *Laburnum*, and other plants are briefly described. In many cases this phenomenon can only be differentiated from ordinary variegation by grafting experiments or growing in the dark, the infectious form developing only in well-lighted plants.

A bibliography of 16 titles is appended.

HAUDUROY (P.). **Le bactériophage de d'Hérelle.** [D'Hérelle's bacteriophage.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 4, pp. 272–302, 1927.

In this account of d'Hérelle's bacteriophage the author suggests that it is an intracellular parasite, a view supported, in his opinion, by the swelling and rupture of the bacilli during lysis.

Inoculation experiments on animals [which are briefly described] are stated to have shown that the injection of an antibacteriophage serum favours the infection of mice by organisms such as Shiga's *Bacillus* [*B. dysenteriae*] and that the bacteriophage behaves as an antigen, causing the formation of specific antibodies in the animal organism into which it is inoculated.

In the author's opinion, only one bacteriophage exists [*R.A.M.*, v, p. 244], certain strains of which produce lysis of staphylococci, others lysis of *B. dysenteriae*, while others again are polyvalent; all, however, are invisible, adaptable to environment, and capable of transmission in series.

Bacilli resistant to the bacteriophage not only develop in secondary cultures [ibid., v, p. 315] but are also found in nature, especially in association with chronic diseases. Their morphological and biochemical characters differ from the normal.

After emphasizing the importance of the fact that the bacteriophage can be cultured only from young, living bacteria, and stating that it is capable of adaptation to harmful antiseptics, such as chinosol or strong glycerin, the author states that since the bacteriophage possesses the properties of reproduction, adaptation, and assimilation in a heterogeneous environment, he regards it as a living organism.

The bacteriophage is stated to exist in healthy human beings and lower animals, in the soil, and in water.

Notes are also given on the use of the bacteriophage as a therapeutic agent in a number of human and animal diseases.

McDougall (W. B.). **Mycorrhizas from North Carolina and Eastern Tennessee.**—*Amer. Journ. of Botany*, xv, 2, pp. 141–148, 3 figs., 1928.

In this paper the author continues his detailed account of the mycorrhiza of various woody plants [*R.A.M.*, vi, p. 680], describing those of 16 species of conifers and broad-leaved trees from North Carolina and Tennessee, including *Liriodendron tulipifera*, *Castanea dentata*, *Betula lutea*, *Magnolia acuminata*, *Quercus velutina*, and some pines, firs, and spruces.

That some forms of mycorrhiza possess fungus mantles which consist of two or more morphologically different layers suggests that in some instances more than one species of fungus may be concerned in their formation.

In the author's opinion, the data obtained support the hypothesis that in the ectotropic mycorrhiza of forest trees the relationship between the fungus and the tree is antagonistic, nct reciprocal, the latter receiving no benefit and being possibly injured by the fungus.

Knudson (L.). **Symbiosis and asymbiosis relative to Orchids.**—*New Phytologist*, xxvi, 5, pp. 328–336, 1927.

The writer's investigations on the germination of orchid seed have led to conclusions totally different from those reached by Costantin [*R.A.M.*, vi, p. 365] with regard to obligate symbiosis. Summing up his views, the author states that the changes induced by the fungus *Rhizoctonia* in the culture medium are of primary importance in the germination of the seed and early growth of the seedling. In the absence of the fungus, equally good results can be obtained by the provision of a suitable culture medium containing organic matter (sugar). The dependence of the orchid embryo on soluble organic matter has been clearly shown, and there is evidence that the capacity for synthesizing food is lacking at this stage of development but not later on. The orchid fungus may be one of the organisms involved in the transformation of insoluble organic matter to sugars, but it is a pure assumption to regard it as necessarily the sole agent in this process. The constancy of association between orchids and symbiotic fungi merely implies that the latter organisms are widely distributed in nature, and that orchid embryos and roots are generally readily infected.

WILSON (E. E.). **Effects of fungous extracts upon the initiation and growth of the perithecia of Venturia inaequalis (Cke.) Wint. in pure culture.**—*Phytopath.*, xvii, 12, pp. 835–836, 1927.

A stimulatory effect similar to that reported by Miss McCormick in connexion with *Thielavia basicola* [*R.A.M.*, v, p. 392] was recently observed when certain fungi occurred as contaminants in Petri dish cultures of *Venturia inaequalis.* Five cultures were treated with 1 c.c. each of a filtered extract of a *Penicillium* grown in pure culture on oatmeal agar; five were treated with the same extract after it had been autoclaved for 20 minutes at 12 lb. pressure; and five with 1 c.c. each of sterile distilled water. After a week at 16° C. the average number of perithecia per 100 sq. mm. was 25 in the dishes containing the non-autoclaved *Penicillium* extract, compared with 6 and 2, respectively, in those receiving the autoclaved extract and the distilled water. A greater vegetative development of the fungus also occurred in the cultures treated with the non-autoclaved extract.

ZIEGLER (O.). **Beiträge zum Abbauproblem der Kartoffel: zur Frage der ökologischen und wirtschaftlichen Beziehungen zwischen der Herkunft der Pflanzkartoffeln und ihrem Verhalten an anderen Anbauorten.** [Contribution to the problem of the degeneration of the Potato: considerations on the question of the ecological and economic relations between the place of origin of seed Potatoes and their behaviour in other areas of cultivation.]—*Naturwissenschaft u. Landwirtschaft*, Heft 13, 90 pp., Verlag Dr. F. P. Datterer & Cie., Freising-München, 1927.

The results of two series of co-ordinated experiments conducted from 1916 to 1922 and from 1922 to 1925, respectively, at seven agricultural experiment stations in Bavaria, showed that the behaviour of imported lines of potatoes (as measured by the yield of tubers in consecutive generations) varied greatly at the different stations both in response to the effect of the local environment and in dependence on the place of their origin. While some lines showed an increase in yield in the first years and then gradually degenerated, in others the yield was restored and even increased after one or two years of reduction, and in others again the degeneration started from the first year and steadily progressed until the final extinction of the line. Some of the latter, in an already advanced state of degeneration, entirely recovered when transplanted in new areas, where they finally yielded more than at their place of initial origin. In lines that were imported anew year after year, it was also noted that the weather conditions which prevailed at their place of origin during the year of their harvesting greatly influenced their subsequent behaviour in the new areas of cultivation.

These facts lead the author to the hypothesis that there exists a certain correlation between the properties acquired by lines of potatoes (which he terms 'disposition') in the locality of their original production, and their behaviour ('diversion') in new areas of cultivation. In accepting Morstatt's views [*R.A.M.*, iv, p. 426]

regarding the influence of local environmental conditions on the deterioration of potato lines, he believes, however, that such factors may also react beneficially on a given line, and that therefore increases in yields must also be considered as modifications of the hereditary properties brought about by changed conditions of cultivation.

A critical analysis of the results of the above-mentioned experiments allows of a tentative formulation of the following correlations between place of origin and place of further cultivation. (1) Potatoes that are transplanted into areas where ecological conditions are similar to those of the place of their origin, degenerate more or less rapidly. (2) Potatoes transplanted into certain opposed ecological conditions show a favourable diversion, and will produce as much as, or more than, in their place of origin. (3) Finally, potatoes that degenerate under one set of ecological conditions, may regain and even surpass their original productiveness when brought under a certain other set of conditions.

From a practical point of view, this hypothesis leads to the conclusion that there can be no question of the intrinsic value of potato 'seed', and that seed testing conducted for only one or two years at a given station is not sufficient, since experiments have shown that seed which showed signs of reduced yield during the first few years, greatly appreciated in the following period. The chief problem of potato seed breeding would appear, therefore, to be that of establishing favourable correlations between the place of breeding and the place of further cultivation, and an attempt is made to indicate some of these correlations in a small table.

SCHLUMBERGER (O.). **Die Beurteilung der Kartoffelkrankheiten bei der Anerkennung.** [The estimation of Potato diseases in certification.]—*Pflanzenbau*, iv, 11, pp. 170–174; 12, pp. 186–190, 1927.

Some general principles are formulated in connexion with the certification of potatoes for freedom from disease, and the regulations obtaining in Germany are compared with those in the United States and Holland [*R.A.M.*, v, pp. 51, 759; vii, p. 265]. Directions are given for the classification of the diseases and for their detection at the first and second field inspections. The infection percentages admissible in the case of the various diseases or groups of diseases are enumerated. Attention is drawn to several characteristic features of the current year's potato crop, one of which was marked tendency in the Holländischer Erstling and Kameke's Goldball varieties to the formation of diminutive tubers directly on the mother tuber instead of the development of normal foliar shoots.

HADFIELD (J. W.). **Government certification of seed Potatoes. Progress of the system in Canterbury.**—*New Zealand Journ. of Agric.*, xxxv, 6, pp. 362–363, 1927.

The system of seed-potato certification introduced in New Zealand in 1927 [*R.A.M.*, vii, p. 113] has met with a very satisfactory response in Canterbury, where 81 growers registered and 138 lines of potatoes were received and planted for testing at the Ashburn Experimental Farm. In addition, more than 100 varieties of

potato from all parts of New Zealand are being grown at the Farm to aid in the preparation of accurate descriptions of all standard varieties, and a start has also been made in the production of pure, healthy lines of commercial varieties, about 250 of which are being grown on trial.

Potato experiments, 1927.—*Govt. of Northern Ireland, Min. of Agric. Leaflet* 7 (*revised 1927*), 13 pp., 3 figs., 1928.

In the newly revised edition of this pamphlet [cf. *R.A.M.*, vi, p. 245], tabulated results are given and discussed of further tests carried out during 1927 upon the cropping capacities of new varieties of potato immune from wart disease [*Synchytrium endobioticum*]. As in 1925–6, Arran Consul, in the district trials, gave a higher average yield of saleable potatoes than any of the other varieties tested.

In a further test, conducted on the checker-board system, the heaviest yield of ware and total tubers was obtained from Glencoe, while the yields of ware tubers obtained from Arran Consul, Up-to-Date (susceptible), and Early Templar were about equal. The introduction of Glencoe and Early Templar, however, is not recommended, owing to the poor cooking quality of the former and the marked susceptibility of the latter to blight [*Phytophthora infestans*].

PERRET (C.). **Les maladies de la Pomme de terre dans le Forez en 1927.** [Potato diseases in Forez in 1927.]—*Rev. Path. Vég. et Ent. Agric.*, xiv, 4, pp. 259–266, 1927.

During the exceptionally wet season of 1927, when July was also rather cooler than usual, a severe outbreak of late blight of potato [*Phytophthora infestans*: *R.A.M.*, vi, p. 574] occurred in the Forez region of the Loire. The disease first appeared (in mild form) on 15th July at an altitude of 350 to 400 m. This was followed by temporary arrest, but on 7th August it broke out on a vast scale, affecting the whole plain and hills up to 700 m. in height. It was then observed that the number of spots on any affected variety diminished with the altitude. By 20th August, blight had reached the mountains, after which date it spread rapidly, until by 10th September only a few isolated patches of Wohltmann and Géante Bleue potatoes remained green, and even these were damaged. The author's observations support the view that the susceptibility of a given variety appears to become more marked as the plant approaches maturity [ibid., vii, p. 113], but it is stated that Violette du Forez, although a late variety, is highly susceptible to blight both of the foliage and tubers, whereas the earlier variety l'Industrie is most resistant.

Spraying with 1 per cent. commercial Bordeaux mixture did not prevent the development of isolated centres of infection, 4 to 5 m. in diameter, and such treatment should be regarded as purely preventive; in seasons when the spread of potato blight is continuous, the effect of one application of Bordeaux mixture becomes inappreciable after 12 days.

In the control of tuber rot, the author strongly advises the removal of the dead leaves immediately after the complete discolora-

tion of the plant, while good results were also obtained by exposing the tubers to the air and light by placing them in barns or straw-covered pits, before storing in cellars or underground.

It is also stated that during 1927 the parasitic wilt disease of potatoes [? *Colletotrichum atramentarium*: ibid., v, pp. 209, 651] was very rare in the region in question, from which it is considered to be disappearing.

SZYMANEK (J.). **Contribution à l'étude du Phytophthora infestans parasite de la Pomme de terre.** [Contribution to the study of *Phytophthora infestans* parasitic on the Potato.]—*Ann. des Épiphyties*, xiii, 4, pp. 213–282, 4 pl., 31 figs., 1927.

This is a detailed study of the morphology of *Phytophthora infestans* in the tissues of the various organs of the potato and in pure culture. The part of the work relating to the mycelium and haustoria of the fungus has already been noticed from another source [*R.A.M.*, vi, p. 505]. Of all the culture media tested the best results were obtained with Pethybridge's quaker-oat agar, haricot bean agar, 3 per cent. glucose solution, and 30 per cent. gum arabic solution. Wide morphological variations of the fungus were noted, especially in media rich in mineral substances, in which it soon produced different forms of spores, including oogonia and oospores. The latter were also observed in nature, in decomposed leaf tissue, and in cultures on soil. In the author's cultures the oospores first appeared as a swelling of a hypha, which was cut off by a septum; in some cases the stalk divided into several branches, each of which in its turn swelled at the apex. At an advanced stage the oospore consists of an endospore enclosing fat granules with some protoplasm and surrounded by a layer of periplasm with an epispore formed from the thickened and corrugated wall of the oogonium. Certain of these bodies show at their base an antheridium adpressed to the surface of the epispore. The shape of the antheridium is fairly constant and is somewhat like that of a conidium. Its wall is rather thick, and the protoplasm is very dense with numerous nuclei and very small vacuoles. In one case the antheridium was distinctly seen to produce a tube which penetrated inside the oogonium. The antheridium appears to arise on the hypha from which the oogonium is differentiated. The front part of the swelling on this hypha develops into the oogonium, while the part behind, separated from the latter by a narrow segment, becomes the antheridium which continues to grow until it comes into contact with the oogonium.

The paper terminates by an investigation made with a view to determining the factors involved in varietal resistance of the potato to *P. infestans*. In the author's opinion there is a close correlation between resistance and the thickness of the cell walls of the parenchyma and of the middle lamellae of the tuber tissues.

A bibliography of 213 titles is appended.

COURET (R.). **Las enfermedades de la Papa.** [Potato diseases.]—*Bol. Mens. Ofic. Def. Agric. Estados Unidos Mexicanos*, i, 6, pp. 474–476, 1927.

A brief, popular account is given of potato blight (*Phytophthora*

infestans), which is stated to cause much damage in warm and humid regions of Mexico, no variety having been found immune. Directions are given for the control of the disease by the application of copper sulphate (with an admixture of 2 l. of molasses per hectol. of solution) [see next abstract], beginning when the plants show their first leaves, and continuing after an interval of three to four weeks. A third treatment, two or three weeks after the second, is necessary in seasons particularly favourable to the development of the fungus. Roughly speaking, the mixture should be applied at the rate of 12 to 15 hectol. per hect. when the foliage is fully developed. Tubers suspected of contamination by *P. infestans* should be exposed to a temperature of 40° C. for two hours to destroy the parasite before being used as seed.

Nota complementaria de la Oficina para la Defensa Agricola. [Supplementary note of the Agricultural Protection Service.] —*Bol. Mens. Ofic. Def. Agric. Estados Unidos Mexicanos*, i, 6, pp. 477–478, 1927.

The distribution of potato blight (*Phytophthora infestans*) in Mexico has been found to be co-extensive with the cultivation of the crop [see preceding abstract]. The disease reaches a climax during July and August and may cause considerable damage, though tomatoes appear to be more severely affected by the attacks of the fungus. Seed tubers should be disinfected by exposure to heat (40° C.) or by immersion in 0·5 per cent. formalin. Spraying with Bordeaux mixture is recommended in preference to the application of copper sulphate. The first treatment should be given when the plants are 10 to 15 cm. in height, the second when they reach 30 cm., and the third when the first buds begin to show. Crop rotation should also be practised.

Raeder (J. M.) & Hungerford (C. W.). **Seed treatment control of Rhizoctonia of Potatoes in Idaho.**—*Phytopath.*, xvii, 12, pp. 793–814, 5 graphs, 1927.

Potato seed treatment experiments for the control of *Corticium vagum* var. *solani* [*C. solani*] similar to those conducted in 1924 and earlier (*Idaho Agric. Exper. Stat. Res. Bull.* 4, 1925), were again carried out on Netted Gem tubers at the Idaho Agricultural Experiment Station in 1925 and 1926. Various proprietary compounds were used in comparison with the cold corrosive sublimate and the cold and hot formalin methods. All the tubers were thoroughly wetted 48 hours before treatment. The amount of infection was calculated by the number of sclerotia on the surfaces of the tubers, since very few stem lesions develop in the region of the trials under ordinary conditions. The results of the trials [which are discussed and tabulated] showed that, of the 29 treatments given in 1925, the best control was obtained with semesan dust applied at the rate of 2 oz. per bushel to presprinkled seed. In 1926 the best of the 31 treatments was four minutes' immersion in a 1 in 120 formalin solution at 125° F. The results given by Dupont dust No. 15 (2 oz. per bushel) were not uniform, the control given by it in 1926 being much less satisfactory than in 1924. It is considered that further trials will be necessary before semesan,

Dupont, or other proprietary disinfectants can be definitely recommended.

Ashplant (H.). **Report of the Rubber Specialist, U.P.A.S.I. for September–October, 1927. Spraying of Rubber. Power and hand sprayers compared.**—*Planters' Chron.*, xxii, 49, pp. 745–749, 1927.

The author describes a test carried out to compare the relative efficiency of a D.S.P. hand sprayer and a power sprayer constructed early in 1927 by Messrs. Drake and Fletcher [Kentish Engineering Works, Maidstone, England] expressly for use on rubber plantations. The latter, which weighs only 220 lb., consists of a Triumph motor-cycle engine mounted on a platform with a powerful pump supplying simultaneously four mistifier spray nozzles, each on 100 ft. of hose. The age of the rubber sprayed was nine years. In spraying 4,327 trees, the mechanical sprayer consumed 25 galls. of petrol and 2 galls. of Mobil oil, while the labour charges per 100 trees worked out at about 6*s.* 11*d.* and supervision at 11*d.* as compared with 7*s.* 10*d.* and 7*d.* in the case of the hand sprayer. Approximately 3·6 galls. of Bordeaux mixture per tree were used by both sprayers. The author estimates the working life of a hand sprayer at from eight to ten years, and the cost of the power sprayer at about £85 compared with £30 for the hand spraying outfit. Under comparable conditions the cost of spraying with the two machines should be approximately the same. The power machine sprayed on an average from 2¼ to 3 acres of rubber up to twelve years old, per day, or more than double the work done by the hand spray outfit, working pressures of from 100 to 160 lb. being easily maintained.

Bobilioff (W.). **Onderzoekingen over vlekkenkanker.** [Investigations on patch canker.]—*Arch. Rubbercult. Nederl.-Indië*, xii, 1, pp. 1–6, 5 pl. (2 col.), 1928. [English summary.]

Severe attacks of patch canker (*Phytophthora*) [*faberi*] have occurred on the rubber estates of West Java during recent years. In some cases the bark was rotted as far as the wood. The symptoms of the disease are described and contrasted with those of brown bast. In patch canker infection originates on the exterior of the cortex and works inwards, while in brown bast the process is reversed. Broadly speaking, patch canker is primarily a disease of the hard bast, the soft bast being relatively little affected.

Two kinds of attack may be distinguished: (1) infection of the undamaged bark, sometimes occurring high up in the stem and sometimes as low as the root collar; (2) patch canker of the tapped bark, frequently associated with stripe canker [*R.A.M.*, vi, p. 575], in which case the streaks on the previously tapped surface characteristic of the latter manifestation develop into the patches of the former in the tapping cut. In plantations in which there is much stripe canker, patch canker is also prevalent, and the association may take one or other of two forms: either the stripe canker on the renewing bark of the older tapping surface changes to patch canker with little or no extension on to the fresh cutting surface, or the

stripe canker spreads from the tapped surface to the actual cutting surface and there becomes a patch canker. Assuming that patch and stripe canker are both caused by the same organism, the author attributes its two forms to the different nature of the affected bark in the renewing part of the tapped cut as compared with the hard bast of the actual cutting surface. The transformation of a stripe canker into a patch canker as it reaches the cutting surface has been observed in several cases, and in some, a further extension under the cork layer into the untapped bark lower down the stem has followed.

Treatment is necessary only in severe cases of patch canker, when the affected tissues should be excised and the wounds painted with an alcoholic solution of resin. The length of the tapping cut should also be curtailed.

SOUTH (F. W.). **Ustulina zonata, (Lév.) Sacc.—A warning note.** —*Malayan Agric. Journ.*, xv, 12, pp. 446–447, 1927.

To prevent the tearing of bark when removing large branches from *Hevea* rubber trees, and the consequent risk of infection of the wound by the dry rot fungus (*Ustulina zonata*), the first cut should be made on the under side near the trunk or main branch and should penetrate about one-third of the thickness; the branch should then be cut through from the upper side at a point a few inches farther out. The stub should then be removed by a clean cut at its junction with the main stem or branch, and the wounded surfaces smoothed and tarred at once, one or two further dressings of tar being applied at intervals of about three weeks. Care must be taken to leave no hollows in which water can collect.

ROODENBURG (J. W. M.). **Zuurstofgebrek in den grond in verband met wortelrot.** [Oxygen deficiency in the soil in relation to root rot.]—Thesis, University of Utrecht, x + 103 pp., 3 pl., 7 figs. (1 col.), 4 diags., 11 graphs, 1927.

The author's investigations were undertaken to determine the factors influencing the varying degree of susceptibility of different plants to abnormal soil conditions, associated primarily with a deficiency of oxygen and a consequent accumulation of carbon dioxide, sulphuretted hydrogen, and other noxious compounds. Among the factors acting adversely on the permeability and aeration of the soil are the presence of stagnant water as a result of continuous rain, flooding, excessive irrigation, or defective drainage; insufficient porosity; a high ground water level; high soil temperatures; and the absence of a superficial crust.

The main features of the condition investigated by the author are illustrated with reference to the rice disease known in the Dutch East Indies as 'omo mentek' or root rot [*R.A.M.*, i, p. 20; ii, p. 8; iii, p. 190], with which the writer considers the Italian 'brusone' and the Japanese 'imoci' to be identical [ibid., i, p. 344]; to root rot (or dongkellan disease) of the type affecting the EK 28 variety of sugar-cane [ibid., vi, p. 378]; and to the Lahaina sugar-cane disease of Hawaii [ibid., vii, p. 271]. Reference is further made to the literature on various more or less similar pathological

conditions of trees and flowering bulbs associated with unfavourable soil relations.

A review of the work of different investigators on the subject of root rot in these cases shows that affected plants are characterized by the following symptoms: stunting or death of the roots, accompanied by the development of adventitious roots immediately below the surface, and by the attacks of root fungi; incomplete development of the stems and suppression of flowers; discoloration, wilting, desiccation, or partial death of the foliage, with severe fungous infection; and a reduction in the dry weight of all affected organs. These symptoms, which vary in different plants and varieties according to the intensity and duration of the abnormal state, may be relieved by the restoration of healthy soil conditions.

According to Hiltner, aerobic root rot is caused by an insufficient absorption of nutritive mineral elements and a disproportionately extensive assimilation of carbohydrates [ibid., vi, p. 578].

In order to study the effects of various modifications in the soil atmosphere, a number of plants were grown in lamp-glasses measuring 20 by 5 cm. filled with the finest black leaf mould. The different gases to be tested were introduced into the cylinders by means of glass tubes inserted in the rubber corks fitted to the bases. The plants, amongst which were bean, beet, hyacinth, *Mahonia aquifolium*, Scotch pine (*Pinus sylvestris*), and elm, were grown in the experimental greenhouse at the Cantonspark, Baarn, at a temperature fluctuating round 20° C.

Hydrogen was found to be innocuous in itself, but it caused a shortage of oxygen which was reflected in the arrested growth of the plants. Carbon dioxide proved injurious when applied for twelve hours in a rapid current until the soil atmosphere contained 100 per cent. of the gas. The root tips and root hairs of the bean plants were severely damaged, and an increased susceptibility to infection by *Thielavia basicola* was shown. Beets were more resistant to the action of carbon dioxide, but they showed a discoloration of the red portions of the roots and a premature wilting of the outer leaves, accompanied by arrested growth. The development of the flowering bulbs was also impeded, while among the woody plants *M. aquifolium* proved very susceptible to this gas. Sulphuretted hydrogen first produced a leaden discoloration of the leaf mould in the glasses, followed by the death of the elm plants and by arrested development in the case of hyacinths, the roots of which were translucent in appearance. Ammonia and hydrochloric acid gas were both highly injurious to the root system of the plants, but the adverse effects of these gases are not apparent until the soil is saturated with them. The admission of stagnant water to the soil causes the immediate withdrawal of oxygen at high temperatures, with a corresponding accumulation of carbon dioxide. At this stage the plants begin to wilt, and if the stagnant water remains for some weeks the formation of reducing substances (e. g., sulphuretted hydrogen) takes place and the roots are seriously damaged and finally destroyed by bacteria.

The concluding section of the work deals with the transport of gases in water-lilies (*Nymphaea marliacea carnea*) in relation to the oxygen content of plant roots.

ARRHENIUS (O.). **Wortelrot en grondeigenschappen.** [Root rot and soil characters.]—*Arch. Suikerind. Nederl.-Indië*, 1 Deel, xxxvi, 6, pp. 129–143, 1928.

The results of the writer's investigations [presented in tabular form] on the correlation of root rot of sugar-cane in Java [see last abstract] with various soil characters, e.g., phosphate content, hydrogen-ion concentration, water-holding capacity, permeability, and nitrate production, were negative except as regards the two last named. The incidence of the disease was found to be highest in soils where nitrate production was lowest. The author disagrees with Kuyper's view that sugar-cane root rot is an analogous disease to grey speck of oats [*R.A.M.*, ii, p. 526, and above, p. 370], but considers it to be more similar to the soil acidity disease of beets [ibid., vi, p. 578], though he failed to find a correlation between hydrogen-ion concentration and the disease. Further studies are necessary to determine the exact nature of the connexion between the disease and a reduction of micro-biological activity in the soil.

JØRGENSEN (C. A.). **Gulspidssygen. Dens Udbredelse, Aarsager og Bekæmpelse.** [Yellow tip disease. Its distribution, causes, and control.]—*Tidsskr. for Planteavl*, xxxiv, 1, pp. 76–116, 1 pl., 10 figs., 1 graph, 1 map, 1928. [English summary.]

This is a full description of the author's personal observations and experiments in connexion with the yellow tip ['reclamation'] disease of oats, barley, and other crops in Denmark [*R.A.M.*, v, p. 543; vi, p. 51; vii, p. 269]. The disease occurs exclusively in Jutland, more especially in the western and northern parts of the peninsula. It is generally found on heath soils reclaimed from 20 to 50 years ago, a fact which points to the implication of the organic substances of the *Calluna* deposits in the causation of the pathological condition. Among other plants susceptible to yellow tip (though in a lesser degree than oats and barley) are swedes and probably turnips, red clover, beans, and peas, while most of the cultivated fodder grasses, rye, white clover, potatoes, mangolds, and *Spergula arvensis* are resistant.

In 1926 the writer undertook a series of experiments [the results of which are discussed and tabulated] to elucidate the effect of copper sulphate on the incidence of the disease. It was first necessary to decide whether the action of $CuSO_4$ is due to the copper or to the sulphate ions, and therefore pots containing affected soil to which calcium sulphate, manganese sulphate, and iron sulphate had been added, were compared with those containing $CuSO_4$ and copper carbonate (all applied at the rate of 75 kg. per hect.). The remedial effect of the copper sulphate was found to be linked with the copper ions.

A preliminary test having shown that yellow tip is amenable to control by autoclaving the diseased soil, a number of sterilizing chemical agents (carbon disulphide, mercuric chloride, formalin, and toluol) were compared with autoclaving and with autoclaving in addition to $CuSO_4$. None of the chemical treatments proved efficacious in the control of the disease, and the same yield was secured by autoclaving whether copper sulphate was present or absent.

These results show (*a*) that the curative action of autoclaving is due to the chemical processes involved, and not to an antiseptic action on the organisms in the soil; and (*b*) that the effects of autoclaving and of copper sulphate on the disease are identical. Yellow tip, therefore, must be caused by some toxic or organic soil compounds which are inactivated by heating and by copper salts [ibid., vii, p. 269]. The difference between the untreated soils and those that received copper sulphate or that were sterilized by heat is as conspicuous in the second as in the first year, and it would seem that the effect of the treatment persists for a considerable period.

In a third series of pot experiments, the untreated heath soil (P_H 6·2) was compared with soil to which lime to produce a P_H value of 6·8 or clay (P_H 6·2) had been added. The incidence of the disease was increased in both the first and subsequent years by the addition of lime. Applications of clay and also of marl cured yellow tip [ibid., i, pp. 209, 210] but they are liable to cause outbreaks of bright or grey speck [see above, p. 370] in the second and following years. This disease does not occur on mineral soils except where the hydrogen-ion concentration is less than P_H 7, but on humus soils it is also found at a slightly acid reaction (up to P_H 6). A P_H value of 6, therefore, should not be exceeded on soils of this type. Bright speck can be controlled by applications of manganese sulphate.

The results of some twenty field experiments indicate that a mixture of 50 kg. $CaCO_3$ and 50 kg. $CuSO_4$ per hect. is probably more effective in the control of yellow tip than 50 kg. $CuSO_4$ alone.

WRANGELL (M. v.) & MÜLLER (K. W.). **Die Reaktion württembergischer Böden. Ein Beitrag zur Frage der Beziehungen von Bodenreaktion zu geologischem Ursprung, landwirtschaftlicher Klassifizierung und Vegetation.** [The reaction of Württemberg soils. A contribution to the question of the relations of soil reaction to geological origin, agricultural classification, and vegetation.]—*Jahreshefte Ver. vaterländ. Naturkunde Württemberg*, lxxxiii, pp. 112–145, 1 graph, 1927.

In connexion with their extensive investigations of the reaction of Württemberg soils, the writers made a study of the conditions governing the occurrence of grey speck disease of cereals [see preceding abstract].

Hudig [*R.A.M.*, iii, p. 425] and others have found that the disease is constantly associated with the presence of humus in the soil, and this was repeatedly confirmed by field observations. Grey speck was noticed primarily on light, rapidly impoverishing, calcareous moor soils, which are extremely rich in humus, generally poor in potash, and of an almost powdery consistency. Such soils do not necessarily possess a high degree of alkalinity, and the disease was, in fact, observed where the reaction was neutral; furthermore, it did not occur on highly alkaline soils without humus.

In pot experiments, barley did not become affected by grey speck at an alkaline reaction (P_H 8·0) produced by the addition of caustic lime to the soil, while severe symptoms occurred on the same host

in soil rendered alkaline by sodium lye. In pure sand cultures containing no admixture of organic substances, the addition of large doses of nitrogen in the form of sodium nitrate (2 gm. per 6 kg. sand) regularly caused the development of grey speck, while similar amounts of ammonium sulphate or nitrate of urea did not produce this effect.

ZATTLER (F.). **Die Untersuchungs- und Auskunftstätigkeit der Hopfenforschungsstelle im Jahre 1927.** [The investigation and extension service of the Hop Research Station in the year 1927.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, v, 10, pp. 243–246, 1928.

A brief account is given of the work carried on during 1927 at the newly established Hop Research Station (a branch of the Bavarian Institute of Agriculture and Plant Protection). Thirty-five specimens of hop vines affected by a brown discoloration of the cortex or medulla of the stems were submitted for examination. The symptoms frequently extended over the whole of the basal shoots, necessitating their removal and replanting with fresh stocks. Species of *Fusarium* [*R.A.M.*, v, p. 126] and *Verticillium* were often found in diseased material.

The occurrence of the mycelium of *Peronospora* [*Pseudoperonospora humuli*] in the inner cortical layers of basal shoots showing a slight yellowish-brown discoloration confirmed Salmon's and Ware's conclusions as to the mode of overwintering of the fungus [ibid., vi, p. 52].

Mosaic disease was not reported, but some suspected cases of curl [ibid., vi, p. 692] were seen.

ZATTLER (F.). **Die Bekämpfung der Peronosporakrankheit des Hopfens und die erzielten Erfolge in Bayern im Jahre 1927.** [The control of the *Peronospora* disease of Hops and the successes achieved in Bavaria in the year 1927.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, v, 10, pp. 254–258, 1 map, 1928.

The losses sustained by the Bavarian hop-growing industry in 1926 on account of the *Peronospora* disease [*Pseudoperonospora humuli*] are estimated at over Mk. 30,000.000. In 1927 the situation was generally improved by an energetic spraying campaign [*R.A.M.*, vii, pp. 116–117], which resulted in a considerably increased yield (average about 8·10 cwt. per hect. as against 2·12 cwt. per hect. in 1926). It is pointed out that the highest yields were obtained in the districts where the hops were sprayed several times (Upper and Lower Bavaria), notwithstanding the great susceptibility of the Hallertau variety which is extensively cultivated in those regions.

KORFF (G.) & ZATTLER (F.). **Die Peronosporakrankheit des Hopfens.** [The *Peronospora* disease of Hops.]—*Arb. Bayer. Landesanst. für Pflanzenbau und Pflanzenschutz*, 5, 42 pp., 1 col. pl., 6 figs., 1 map, 1928.

The sections of this work dealing with the control of downy mildew of hops (*Pseudoperonospora humuli*) and with the investi-

gations of the Hop Research Station during 1927 have already been noticed from another source [see preceding abstracts].

Although no definite evidence is available, it is considered highly probable that the oospores of the fungus are responsible for the infection of the young shoots in the spring. This assumption is based partly on analogy with the known mode of infection in the closely related *Peronospora* of the vine [*Plasmopara viticola*], and partly on the presence of large numbers of oospores in the diseased organs.

Experiments have shown that the viability of the zoosporangia extends over a period of four to five weeks. At room temperature the zoospores are liberated about $1\frac{1}{2}$ to 3 hours after placing the sporangia in water: the process is delayed for several hours at 7·5° to 8·5° C. but the motility of the zoospores is retained for a considerably longer period than at room temperature (24 hours or more compared with 4 to 6). These observations provide an explanation of the higher incidence of infection during cold weather, which may also weaken the resistance of the host.

Diseased lateral shoots were found to arise through infection by the zoospores, the germ-tubes from which penetrate the stomata of the stem. The mycelium developing within the infected stem attacks the leaves through the petioles. Young leaves and primordia are entirely infested by the mycelium, which almost reaches the growing point. All the leaves infected at this early stage show a more or less pronounced stunting, but this symptom may be scarcely noticeable in shoots attacked at a later period of development: these, on the contrary, may exhibit a great profusion of foliage. Artificial inoculation experiments in this mode of infection resulted in the production of diseased shoots in 16 out of 20 cases, the mycelium advancing from the base of the shoot along the petioles towards the laminae which became uniformly infected from below upwards. In direct leaf infection by zoospores, on the other hand, the infection is localized in a number of points on the lamina. It has not yet been ascertained whether the axillary buds can be infected by zoospores.

The results of some 170 inoculation experiments indicate that the duration of the incubation period may range from 1 to 10 days (average $2\frac{1}{2}$ to 4 days in the summer) according to temperature and atmospheric humidity. The practical outcome of these observations is the necessity for spraying at least every week during wet weather, beginning within three days after a fall of rain, instead of a fortnight later as in the case of downy mildew of the vine.

During 1927 a number of preparations were tested for the control of *P. humuli*. None of these equalled Bordeaux mixture in efficacy, and nosprasen definitely injured the treated plants. Bordeaux mixture was applied at a higher concentration than in the previous year (1 instead of 0·5 per cent.) owing to the prevailing wet weather, with very satisfactory results.

Salmon (E. S.). **The downy mildew of the Hop.**—*Brewers' Journ.*, lxiv, 751, pp. 44–47, 1928.

In this paper the author reviews the work of Blattný on the

downy mildew of the hop (*Pseudoperonospora humuli*) and discusses the conclusions reached in Czecho-Slovakia in the light of his own recent observations [*R.A.M.*, vi, p. 690; vii, p. 196]. The resistance of the Fuggles variety, even under the most favourable conditions for infection, strongly suggests the existence of specialized forms of the fungus. In this connexion attention is drawn to the conflicting results obtained by Blattný and the author with the Japanese hop (*Humulus japonicus*), which proved very susceptible to downy mildew in Czecho-Slovakia while maintaining complete immunity at Wye. It is thought probable that the so-called 'mid-European Golding' variety, which is being so widely used in Jugo-Slavia and Czecho-Slovakia to replace the susceptible Württemberg, is identical with Fuggles. In England hops should not be sprayed when in flower or fertilization will be impeded; and neither Bordeaux nor Burgundy mixture should be applied after cone formation, as the copper may impair the flavour for brewing [loc. cit.].

Wood (E. J. F.). **Investigations into diseases of Cane.**—*Twenty-seventh Ann. Rept. Bureau of Sugar Exper. Stations*, pp. 27–33, 1927.

Most of the information contained in this annual report of the Assistant to the Pathologist at the Queensland Bureau of Sugar Experiment Stations has already been noticed from the monthly summaries [*R.A.M.*, vii, p. 58 *et passim*]. The incidence of the more important diseases of sugar-cane, as revealed by the writer's field inspections in seventeen districts, is shown by tables. From the observations on varietal reaction to the different diseases, it appears that the Goru canes (N.G. 24, 24A, and 24B) are highly susceptible to leaf scald [*Bacterium* sp.] and gumming [*Bact. vascularum*], and their cultivation north of Townsville should be prohibited. B. 208 and Shahjahanpur 10 should not be grown at all on account of their great susceptibility to all diseases, while 7 R428 (Pompey) is also liable to gumming, Fiji disease [*Northiella sacchari*], leaf scald, leaf stripe [*Sclerospora sacchari*], and mosaic. M. 189 (Black Innes) is highly susceptible to mosaic, gumming, and red rot [*Colletotrichum falcatum*] and should not be grown where these occur.

Rosenfeld (A. H.). **Lessons from the renaissance of a Sugar industry.**—*Internat. Sugar Journ.*, xxix, 348, pp. 634–641, 1 pl., 1927.

On pp. 635 to 637 of this article, which deal with the saving of the sugar industry in the Argentine Province of Tucumán by the substitution of the P.O.J. varieties 36, 213, and 234 for the previously grown Louisiana Striped and Purple, the yield of which had persistently declined owing to mosaic disease [*R.A.M.*, iv, 244, 378], it is stated that experiments conducted from 1910–15 showed that the annual yield per acre of the latter canes averaged 9 tons of cane and about $\frac{3}{4}$ ton of sugar. During this period. P.O.J. 213 averaged about 30 tons of cane and $2\frac{1}{2}$ tons of sugar, P.O.J. 36 about 26 tons of cane and $2\frac{1}{4}$ tons of sugar, and P.O.J. 234 more than 20 tons of cane and nearly 2 tons of sugar, per acre. The new canes were more resistant to diseases (including mosaic) and insect

attacks than the existing varieties, endured much lower temperatures, and provided more bagasse, which was of better quality. In 1916, when the yield of Louisiana Striped and Purple canes fell to about 8 tons of cane per acre, some 50,000 acres were planted with the new varieties, mostly P.O.J. 213; a further 60,000 acres were similarly planted in 1917.

In 1919 Tucumán produced the second largest sugar crop in its history; it amounted to more than 246,000 tons, of which about 90 per cent. was yielded by the P.O.J. canes, although some 30 per cent. of the cane-growing area remained under the earlier varieties. These had almost disappeared from cultivation by 1920, and in 1925 and 1926 the sugar produced in Tucumán amounted to 310,000 and 375,000 tons, respectively.

In the concluding section of the paper, the application of this experience to Louisiana conditions is urged. Cane yields in Louisiana are stated to have declined in the same way and from much the same causes as in Tucumán, and the P.O.J. canes, which appear to do exceedingly well in Louisiana, are regarded as offering the best promise of resuscitating the industry.

FARIS (J. A.). **Some Sugar Cane leaf spots in Cuba. Notes on observations of certain affections of Cane, including two believed to be new to science.**—*Facts about Sugar*, xxii, 49, pp. 1183–1184, 1927.

In this paper, read before the meeting of the International Society of Sugar-cane Technologists at Havana in March, 1927, the writer gives concise descriptions of some leaf spots occurring in Cuba, of which brown stripe and spindle blotch are believed to be new to science.

Eye spot (*Helminthosporium sacchari*) [*R.A.M.*, vii, p. 199] is now so serious on the Fajardo seedlings 137, 214, and 306, as well as D. 109, that further planting of these varieties is considered very risky. This disease has probably been disseminated throughout the island by the recent bulk importations of cane from Porto Rico.

Brown stripe, associated with a species of *Helminthosporium* distinguished from *H. sacchari* by its darker spores and different cultural characters, is conspicuous from the middle of November till the following July. The leaves of the highly susceptible Cristalina variety (which is resistant to eye spot) are covered with brown, linear stripes, measuring on an average 1 to 3 mm. in width by 1 to 3 cm. in length, and surrounded by a paler-coloured halo.

The common ring spot due to *Leptosphaeria sacchari* occurs throughout the island, producing greyish lesions with a red border. It is not of sufficient importance to justify control measures.

A species of *Coniothyrium* is associated with a blotching of the leaves by grey, red-bordered lesions, up to 0·5 cm. wide and several inches in length, but inoculation experiments with this organism gave negative results.

Another blotch, similar in some respects to the foregoing, attacks the tops of several varieties, including Cristalina, Badila, S.C. 12(4), and D. 117. Infection is believed to occur in the spindle, possibly when it is filled with water, and this results in an irregular blotch extending rapidly up the leaf to the edge. These areas may attain

an inch in width, tapering to a red streak following the veins to the tip. The most advanced zone of the lesion is usually of a brownish-red colour, forming a very narrow line between the green healthy tissue and the greyish diseased centre. This red mark may be absent in certain varieties or in newly formed blotches, which look wilted and watery but soon dry to a greyish colour. An infection centre may involve several leaves, even extending to the middle of the central leafy shoot and causing a section blotch on all the leaves contained therein. Sometimes the diseased leaves break over and the entire top of the stalk may rot.

Spindle blotch, which was first noticed in 1925, spreads very rapidly under favourable conditions. In some respects it resembles bacterial blotch of sorghum [? *Bacterium holci*: ibid., vi, p. 478], from which, however, it differs considerably in its mode of spread through the leaf.

Cold chlorosis [ibid., vii, p. 119] has been experimentally induced by placing melting ice in the spindle of growing canes.

FARIS (J. A.). **Brown stripe of Sugar Cane in Cuba.**—Abs. in *Phytopath.*, xviii, 1, p. 135, 1928.

Brown stripe of sugar-cane [see preceding abstract], formerly believed to be an immature stage of eye spot (*Helminthosporium sacchari*), is now thought to be possibly caused by *H. stenospilum* n. sp. [see next abstract]. The difference between the two diseases has been demonstrated by inoculating many plants under sterile conditions, and the causal organisms also vary in cultural and morphological characters.

DRECHSLER (C.). **A species of Helminthosporium distinct from Helminthosporium sacchari, causing brown stripe of Sugar Cane.**—Abs. in *Phytopath.*, xviii, 1, pp. 135–136, 1928.

The examination of diseased sugar-cane specimens from Georgia, Florida, and Cuba has revealed two species of *Helminthosporium*, causing foliar injury [see preceding abstracts]. Lesions in some Cuban material appearing as elliptical, reddish-brown spots, up to 20 by 3 mm., with somewhat bleached centres and zonal markings, yield under moist conditions a fungus producing fuliginous conidia with a thin peripheral wall and 3 to 10 septa (average 6·7), measuring 32 to 103 μ in length (average 71 μ) by 9 to 17 μ in width (average 14 μ). Under similar conditions lesions in leaves from Georgia, Florida, and Cuba, appearing first as very narrow, linear, brown streaks, later often enlarging or coalescing, develop a form producing dark olivaceous conidia with a thick peripheral wall and 3 to 12 septa (average 7·7), measuring 40 to 128 μ in length (average 83 μ) by 12 to 22 μ in width (average 17 μ). The former of these two organisms is considered to be identical with *H. sacchari*, while the latter is provisionally named *H. stenospilum* n.sp.

AZZI (R.). **Uma nova molestia da Canna de Assucar.** [A new disease of Sugar-cane.]—*Bol. Agric. São Paulo*, Sér. xxviii[a], 9–10, pp. 526–532, 4 figs., 1927.

Referring to Fawcett's work on cold chlorosis of sugar-cane

[*R.A.M.*, vii, p. 119], the writer records the widespread occurrence of this disease [the symptoms of which are briefly described] in São Paulo, Brazil, where all the commonly cultivated varieties appear to be affected, including the recent Javanese importations and Taquara or Cavallo. Similar symptoms have also been observed on Crystal millet, and it is believed that other Gramineae may also be attacked.

Microscopic examination of diseased material revealed the presence, in the parenchyma cells, of an extremely minute organism, which is thought to be the agent of infection. This is a highly motile, rod-shaped, flagellate bacterium, measuring 1·8 by 0·9 μ and forming hyaline or slightly milky colonies on an agar and leaf extract medium.

The new Java P.O.J. 2878 Cane.—*Internat. Sugar Journ.*, xxx, 350, pp. 61–62, 1928.

It is reported that the new Java P.O.J. 2878 cane, the planting of which is rapidly extending in Java [*R.A.M.*, vi, p. 639] has begun to show a disquieting susceptibility to top rot [ibid., vii, p. 200] as also, and to an even greater extent, has another new cane, P.O.J. 2722. Though they appear more susceptible to this disease than the varieties hitherto grown, it is as yet too early to say whether this will prove a serious bar to their cultivation.

Costantin (J.). **La cure d'altitude, son emploi et son efficacité en pathologie végétale. Essai d'une théorie de ce phénomène.** [The altitude cure, its use and effectiveness in plant pathology. An attempt at a theory of this phenomenon.]—*Ann. Sci. Nat., Bot.*, Sér. X, ix, 2, pp. 299–364, 8 figs., 1 graph, 1927.

In the author's opinion, the sereh disease of sugar-cane in Java [the history of which is described in some detail] is due to vegetative propagation in the hot plains, where the plants become deprived of the mycorrhizal fungi which enable them to preserve their hereditary vigour. The success of the hill-nursery method of fighting this disease [*R.A.M.*, vi, p. 639] is held to indicate that a mountain climate is particularly suited to sugar-cane, the weakened plants being temporarily restored to their natural vigour or 'rusticity' by the higher altitude [ibid., iv, pp. 49, 372]. The resistance to sereh shown by the P.O.J. canes is attributed to the rusticity imparted to the susceptible Cheribon variety by the hardy Indian Chunnee cane (which belongs to the group of thin canes now regarded by some authorities as a species, *Saccharum barberi*, distinct from the thicker species, *S. officinalis*) with which it was crossed, while the resistance of the Chunnee cane itself is attributed to its mountain origin [the author quotes a statement that this variety is a native of the outer foot hills of the Himalaya], and is stated to be probably related to the presence of mycorrhiza in the roots.

In discussing other theories of the cause of sereh and the view that it is an insect-carried virus disease, the author suggests that the plants, reinvigorated by removal to the mountains, may produce antigens which, in the progeny grown at the lower levels, neutralize the virus. The hot water treatment [ibid., vii, p. 271]

may, it is suggested, destroy the virus, but experiments are required to test whether it may not also destroy the antigens, in which case its utilization to replace the action of high altitudes is to be deprecated.

A five-page bibliography is appended.

BRITON-JONES (H. R.). **A note on green muscardine (Metarrhizium anisopliae Sorokin).**—*Minutes & Proc. Froghopper Invest. Ctte. Trinidad & Tobago*, ix, pp. 293–305, 1 pl., 1927.

After a brief account of the work of previous investigators on the control of the sugar-cane froghopper [*Tomaspis saccharina*] in Trinidad by means of the green muscardine fungus (*Metarrhizium anisopliae*) [*R.A.M.*, vi, p. 30], the writer describes his own recent experiments in this direction.

It was found that the occasional failure of the spores to germinate within twenty days was due to an excess of moisture in the medium. Observations on several series of pure cultures showed a definite correlation between staling and sporulation up to a critical point beyond which growth falls rapidly and eventually ceases. The rate of staling depends on (*a*) the number of spores sown to the unit surface of medium; (*b*) the thickness of the medium; and (*c*) the amount of moisture present. By a judicious application of these data it was found possible to induce abundant sporulation in five instead of twenty days. In the case of test-tube cultures on potato wedges, this result was obtained simply by omitting the usual plug of saturated cotton wool at the bottom of the tube. Crops of spores were also produced in steam sterilizer cabinets in five days on yams [*Dioscorea*], potato, and sweet potato by controlling the amount of moisture, regulating the thickness of the medium to about half an inch, and reducing the surface of the medium by smoothing it with a roller.

Inoculation experiments with *M. anisopliae* corroborated the data obtained by previous workers, namely, that adult froghoppers and nymphs are destroyed under conditions favouring spore germination. Some difficulty was experienced in infecting the nymphs, which are effectively protected by a spittle mass.

The best method of distribution is by means of trays fixed under lights in rain-proof traps. Given suitable weather conditions and severe froghopper invasion, epidemics of disease can be induced by artificial infection under field conditions. Notwithstanding this, however, the fields may be so badly damaged by the froghopper blight as to necessitate abandonment. The writer's considered opinion is that the use of green muscardine is impracticable for the control of froghopper damage on a large scale.

GUILLIERMOND (A.). **Quelques faits nouveaux relatifs au développement du Spermophthora gossypii.** [Some new facts concerning the development of *Spermophthora gossypii*.]—*Comptes rendus Acad. des Sciences*, clxxxvi, 3, pp. 161–163, 1928.

Continued cytological observations on the development of *Spermophthora gossypii* [*R.A.M.*, vi, p. 697] (which seems to have characters intermediate between the Phycomycetes and Ascomy-

cetes) show that the non-septate mycelium contains scattered, large nuclei with a chondriome, and numerous vacuoles filled with metachromatin and globules of fat; it also contains, outside the vacuoles, crystalloids comparable to those of mucorin. The hyphae grow apically, while the older parts degenerate, but frequently a living portion of protoplasm in the degenerated hyphae is separated by transverse septa and forms a cell resembling a chlamydospore. The hyphae also produce lateral, yeast-like cells which never separate from the hyphae and degenerate together with the latter.

In beer-wort the fungus forms a sterile mycelium of hyphae, inside which abundant callose is produced as an ingrowth from the walls; finally the hyphae are frequently filled to a considerable length with callose alone, giving rise to formations entirely comparable to those that have been observed in the Peronosporaceae. The secondary mycelium that is formed as a result of the fusion of the gametes was found to be septate and with cells that are always uninucleate; most frequently this mycelium is branched, and each hypha terminates in an ascus, but occasionally an ascus may be formed from an intercalary cell or may develop by budding directly on the fusion canal. After the asci are formed, the mycelium degenerates. The ascospores swell up, rupture the ascus wall, and germinate with the production of a primary unseptate mycelium forming gametangia. Many gametes germinate without fusion, and give rise directly to a secondary mycelium bearing asci, or to a sterile mycelium which degenerates. The gametes have not been seen to give rise directly to a primary mycelium, as claimed by Ashby and Nowell. Thus, *S. gossypii* develops a primary, non-septate mycelium similar to that of a Phycomycete, and a secondary, septate mycelium like that of an Ascomycete.

HIRATSUKA (N.). **Beiträge zu einer Monographie der Gattung Pucciniastrum Otth.** [Contributions to a monograph of the genus *Pucciniastrum* Otth.]—*Journ. Fac. Agric. Hokkaido Imper. Univ., Sapporo, Japan*, xxi, 3, pp. 63–119, 1 pl., 1927.

In this contribution to a monograph of the genus *Pucciniastrum* the author enumerates 22 species, of which 17 occur in Japan. It is considered highly probable from the characters of the uredosori that the perfect stage of *Uredo fuchsiae* on *Fuchsia splendens* is a *Pucciniastrum*, for which the name *P. fuchsiae* nov. comb. is tentatively proposed. A table is given showing the geographical distribution of the genus, together with a list of the species and their synonyms, and a host index. A bibliography of 172 titles is appended.

HIRATSUKA (N.). **A contribution to the knowledge of the Melampsoraceae of Hokkaido.**—*Japanese Journ. of Botany*, iii, 4, pp. 289–322, 1927.

In this paper the author enumerates 58 species of *Melampsora*, *Chrysomyxa*, and related genera of fungi occurring in Hokkaido (Japan) [*R.A.M.*, vi, p. 756]. Two of the species listed (*Chnoopsora itóana* on *Oxalis acetosella* and *Phakopsora artemisiae* on

Artemisia vulgaris) are stated to be new. Host and fungus indices are appended.

CUNNINGHAM (G. H.). **The Polyporaceae of New Zealand.**—*Trans. New Zealand Inst.*, lviii, pp. 202–250, 11 pl., 1927. [Received April, 1928.]

In this first part of a monograph of the Polyporaceae that occur in New Zealand, the author lists six species of the genus *Fomes* (including *Ganoderma*) and seventeen species of the genus *Polyporus* (including *Polystictus*), among which the following are stated to be of parasitic habit. *Fomes robustus*, which is said to be not uncommon in beech (*Nothofagus*) forests of the Wellington province, where it produces a serious heart rot of *N. fusca*; a specialized form causes a white heart rot of *Cassinia leptophylla* in the Weraroa and Featherston districts, rapidly killing this shrub. *F. australis* (*G. australe*) causes a serious heart rot of numerous timber trees, e.g. *Nothofagus*, *Podocarpus spicatus*, &c. *Polyporus* (*Polystictus*) *versicolor* has been found to cause a serious disease, resembling that caused by *Stereum purpureum*, of peach trees in the Auckland province. *P. eucalyptorum* produces a serious heart rot of *Nothofagus fusca* and other species of this genus in the Wellington province.

WOLF (F. A.). **The morphology and systematic position of the fungus, Microstroma juglandis (Bereng.) Sacc.**—*Journ. Elisha Mitchell Sci. Soc.*, xliii, 1–2, pp. 97–100, 1 pl., 1927.

A detailed study of *Microstroma juglandis* [*R.A.M.*, iv, p. 130] as found on hickory leaves [*Hicoria* spp.], and of *M. juglandis* var. *robustum* on pecan catkins [*Carya pecan*] showed that each fruit body of the fungus consists of dense aggregates of parallel hyphae, the basal portion of which occupies the substomatal cavity. The hyphae converge at the orifice of the stoma and spread out above the host tissues in a fascicle of conidiophores, each of which is a clavate cell bearing, on short sterigmata, two to six oblong or ellipsoidal conidia, 6 to 8 by 4·5 μ. The hilum is basal, not extrorse, as is the attachment of basidiospores.

The mycelium is entirely intercellular and consists of very thin hyphae with uninucleate cells. At an early stage in the differentiation of the conidiophores the latter are also uninucleate but they become multinucleate just before emerging from the stomata. A single nucleus passes into each conidium as it is formed, but some are left behind and no doubt multiply to supply the successive crops of conidia that are apparently formed from the same conidiophore.

When the conidia are germinated on agar, there is no evidence of hyphal formation, the conidia giving rise by budding to oval or elliptical bodies until greyish-white colonies are formed.

As these observations show that the conidiophores are not basidia, the conidia are not basidiospores, and that conjugate nuclei are lacking, the author considers that the organism is not a Basidiomycete but must be regarded as one of the Melanconiaceae, near such genera as *Colletotrichum* and *Cylindrosporium* [but see next abstract].

PIRES (V. M.). **Concerning the morphology of Microstroma and the taxonomic position of the genus.**—*Amer. Journ. of Botany*, xv, 2, pp. 132–140, 8 figs., 1928.

In this account of his morphological and cytological studies of *Microstroma juglandis* [see preceding abstract], *M. juglandis* var. *robustum*, *M. album* (*Helostroma album*), and *M. pithecolobii*, the author states that in his (authentic) material, *M. album* shows the structure indicated by Patouillard (*Bull. Soc. Myc. de France*, xviii, p. 52, 1902) and is sufficiently distinct from the other species to justify Patouillard's creation of the genus *Helostroma* for it. The mycelium is intercellular and forms stromatic masses under the stomata. The stromata are approximately 25 μ thick, and produce cylindrical conidiophores, 25 to 35 μ long, having lateral enlargements at the tips and also at various levels; each enlargement bears six or seven hyaline, ellipsoidal conidia, measuring 5 to 6 by 2 to 3 μ.

In the author's material, the intercellular mycelium of *M. juglandis* was composed of hyphae averaging 1 to 1·5 μ in diameter, and the stromata measured approximately 45 by 35 μ. The basidia, 17 to 20 μ long, are clavate, usually with six sterigmata on which are borne six rod-shaped, uninucleate spores with rounded ends, measuring 5·8 to 7·3 by 2 to 2·19 μ. The mycelial cells are binucleate and clamp-connexions are present.

M. juglandis var. *robustum* is very similar except that the stromata, basidia, and spores are larger.

In *M. pithecolobii* the cells of the stalks of the basidia contained two structures which stained darkly and gave every indication of being nuclei, though the material was not in good condition for cytological study.

The author considers that the presence of binucleate mycelial cells and clamp-connexions justifies placing *M. juglandis* among the Basidiomycetes, and the other species are believed to have a similar systematic position.

A bibliography of 32 titles is appended.

GONZÁLEZ FRAGOSO (R.). **Enumeración y distribución geográfica de los Esferopsidales conocidos de la Península Ibérica.** [Enumeration and geographical distribution of the Sphaeropsidales known in the Iberian Peninsula.]—*Trab. Mus. Nac. Cien. Nat.*, Ser. Bot., 23, 59 pp., 1927.

It appears from the preface that this is the commencement of a list of the Sphaeropsidaceae of Spain and Portugal: it includes the families Nectrioidaceae, Leptostromaceae, Excipulaceae, and Melanconiaceae.

SMALL (W.). **Further occurrences of Rhizoctonia bataticola (Taub.) Butler.**—*Trop. Agriculturist*, lxix, 4, pp. 202–203, 1927.

Since the publication of the last list of hosts of *Rhizoctonia bataticola* [*Macrophomina phaseoli*: *R.A.M.*, vii, p. 62] this fungus has been found on a number of further plants in Ceylon, in association with root disease, and its known distribution in Ceylon has been extended to include the Jaffna district. The new hosts

include sesame (*Sesamum indicum*), on which the fungus causes a root disease similar to that which occurs in Uganda and Burma; eggplant (*Solanum melongena*) and pigeon-pea (*Cajanus indicus*), on which the sclerotia of the fungus are found in large numbers on the wood and in the decayed cortical tissue of the roots and collar; Guinea grass (*Panicum maximum*) which is killed in clumps or patches; Palmyra palm (*Borassus flabellifer*), which in the Jaffna district may be found either singly or in small groups killed by the fungus. An investigation into the death of young *Eucalyptus* (? *robusta*) setts some time after planting showed that *R. bataticola* was responsible for their loss, since the sclerotia were found in numbers in the stringy remains of the cortex of the roots and collar.

It is added that the author has been enabled to establish the presence of *R. bataticola* on the roots of *Hevea* rubber from material received from Uganda and south India.

BRITON-JONES (H. R.). **Mycological note. Macrophomina phaseoli (Maubl.) Ashby.**—*Trop. Agriculture*, iv, 10, pp. 194–195, 1927.

With reference to Gadd's and Small's controversy on *Rhizoctonia bataticola* (*Macrophomina phaseoli*) [*R.A.M.*, vi, p. 742], the author is not inclined to accept Small's views as to the immediate responsibility of this fungus for root diseases of cultivated plants, the more so since there are definite indications that in some cases (e.g., on jute in Formosa and on lime trees in Dominica) it follows a check to the host due to physiological or other causes. In his opinion, the question is yet far from being settled, and demands further investigation both from the mycological and phytopathological points of view.

PRIODE (C. N.). **Further studies in the ring-spot disease of Tobacco.**—*Amer. Journ. of Botany*, xv, 1, pp. 88–93, 6 figs., 1928.

Inoculations of thirty tobacco plants made by placing juice from plants affected with ring spot [*R.A.M.*, vi, p. 699] upon different portions of the leaves resulted in the appearance of local symptoms after three to five days, followed in every case by systemic infection shortly after. In other experiments, a few instances were observed in which the disease remained localized in the inoculated tissues only. When needle prick inoculations are used, a single ring spot first appears, with its centre about the point of the wound. Out of 126 needle prick inoculations only 36 succeeded. Inoculations into the stem tissues resulted in systemic infection without local symptoms.

In cross-inoculation experiments the disease was successfully transmitted to beet, pokeweed (*Phytolacca decandra*), petunia, and New Zealand spinach (*Tetragonia expansa*). Beet and pokeweed developed typical rings on the leaves to which the inoculum was applied, but there was no extension of the disease beyond the inoculated area. Petunias proved highly susceptible. On this host the lesions closely resembled those produced on tobacco, the local symptoms being followed by systemic infection on the young

leaves. In the early stages, young petunia leaves showed chlorotic areas (consisting of wavy lines and rings) rather than necrosis; after a few days, most of the affected tissues died, but some of the chlorotic rings appeared to live indefinitely. Ring spots similar to those on tobacco leaves developed round needle prick inoculation wounds on fully grown petunia leaves, one experiment yielding 27 successful infections out of 45 inoculations.

The symptoms of the disease on New Zealand spinach resembled those on tobacco and petunia, except that stem symptoms also developed. These appeared as small, depressed streaks or elliptical rings near the points where diseased leaves were borne, gradually extending to all the upper portions of the diseased stems. Necrosis was so severe in the stem tissues that the tips of certain branches died. No bacteria or fungi were found in the blackened tissues of these lesions. Young tobacco plants inoculated with juice from affected New Zealand spinach stems developed typical ring spot after five days.

Attempts to inoculate 16 other species, including potato, tomato, eggplant, and pepper [*Capsicum annum*], failed.

Dried material from diseased tobacco plants failed to produce infection; infected juice stored at $-5°$ C. retained its virulence for 85 days, while other juice stored at 0°, 5°, 10°, 15°, and 20° retained its virulence for 21, 20, 12, 4 days and 1 day, respectively. Six hundred tobacco plants grown to maturity from seeds taken from badly diseased plants all remained healthy.

Although the infectious principle in diseased tobacco juice did not pass through a grade N Berkefeld filter, the author considers that ring spot belongs nevertheless to the virus group of diseases.

PURDY (HELEN A.). **Multiplication of the virus of Tobacco mosaic in detached leaves.**—*Amer. Journ. of Botany*, xv, 1, pp. 94–99, 1 fig., 1928.

This paper is a more detailed account of experiments the results of which have already been noted from another source [*R.A.M.*, vi, p. 443].

Of 142 detached leaves inoculated with dilutions of the original inoculum exceeding 2×10^{-5}, 120 contained sap capable of inducing mosaic in healthy tobacco and tomato plants.

PURDY (HELEN A.). **The improbability of Tobacco mosaic transmission by slugs.**—*Amer. Journ. of Botany*, xv, 1, pp. 100–101, 1 fig., 1928.

Slugs (*Limax maximus* and *L. agrestis*) after being confined under bell jars for from two to fourteen days with tobacco and tomato plants affected with mosaic disease were allowed to feed heavily upon healthy plants. No infection resulted, although when macerated they contained bits of green plant tissue with which successful inoculations were performed.

CAVADAS (D. S.). **Greece: bacterial diseases of Tobacco in connection with Gnorimoschema heliopa in Thessaly.**—*Internat. Bull. of Plant Protect.*, i, 11, pp. 169–170, 1927.

Tobacco in Thessaly was seriously injured during the late summer

of 1927 by several bacterial diseases, including an affection attributed to *Bacillus aeruginosus*, another caused by *B. maculicola* [*R.A.M.*, iv, p. 446], and wildfire (*Bacterium tabacum*). The last-named, though existing in Greece in an endemic form, rarely causes any great damage except on young plants. All the above-mentioned organisms appear first on plants attacked by the moth *Gnorimoschema* [*Phthorimaea*] *heliopa*, which was first observed in Thessaly on a considerable scale in 1927.

PITTMAN (H. A.). **Spotted wilt of Tomatoes.**—*Journ. Council for Sci. and Indus. Res.* [*Australia*], i, 2, pp. 74–77, 2 figs. (facing p. 122), 1927.

In this preliminary account of investigations at the Waite Agricultural Institute, South Australia, into the insect transmission of spotted wilt of tomatoes [*R.A.M.*, vii, p. 67], the author briefly recapitulates the evidence that the disease belongs to the virus group, and draws attention to its marked indifference to manurial or physical treatment of the soil, and to its occurrence in climates as sharply contrasted as those of Perth and Brisbane in Australia.

As inoculations with the expressed juice of wilted tomato plants invariably gave negative results, the author considers it probable, by analogy with other virus diseases, that only an insect vector is concerned. Experiments with several different species of insects gave negative results, except with the onion or rose thrips (*Thrips tabaci* Lindeman). When this insect was allowed to feed for from two to twelve days on diseased tomato plants, and was then transferred to healthy seedlings of Golden Queen, Burwood Prize, and Sensation tomatoes growing in an insect-proof glasshouse, it caused the appearance of typical symptoms of spotted wilt in 16 to 49 days, the adjacent controls (as well as hundreds of other tomato plants kept free from insects) remaining perfectly healthy throughout. The disease was relatively common during the same period in commercial tomato houses in the neighbourhood. Only larvae were used in the transmission tests, but the author believes that under natural conditions the disease is probably also transmitted by the adult form.

As the insects fall to the ground after a few days, their disappearance from the plant so long before infection becomes evident may account for their connexion with tomato wilt not being suspected, especially as the feeding marks are often so minute as to be easily overlooked.

NOBLE (R. J.). **Spotted wilt in Tomatoes.**—*Agric. Gaz. New South Wales*, xxxix, 1, pp. 59–63, 3 figs., 1928.

Spotted wilt of tomatoes [see preceding abstract] recently caused severe losses in New South Wales, more than 90 per cent. of the plants being affected in some areas. No resistant commercial varieties are known.

Portions of diseased tissue were inserted into healthy plants on 9th March, 1925, and symptoms of the disease developed between the 23rd and 31st March, while control plants inoculated with healthy tissue remained unaffected. Healthy seedlings to which capsids were transferred from diseased plants developed the disease.

The evidence obtained also suggests that the disease is carried over from year to year in infected tomato plants or weeds of the same family. Control consists in promptly destroying affected plants and neighbouring weeds, staking and pruning, and early and frequent spraying with insecticides.

McWhorter (F. P.). **The early-blight diseases of Tomato.**—*Virginia Truck Exper. Stat. Bull.* 59, pp. 547–566, 5 figs., 1927.

The author states that *Macrosporium* [*Alternaria*] *solani* is one of the commonest causes of seedling blight or damping-off in tomatoes, causing lesions on the rootlets which are darker and more numerous than those produced by *Corticium vagum* [*C. solani*]. It also often girdles the larger seedlings just below the collar, this stage of early blight passing directly into the destructive foot rot, black leg, or collar rot stage, in which the girdled plants break in two. In Virginia, *A. solani* is the most frequent cause of this form of injury, and is usually followed by leaf blight, but stem blight may supervene on foot-rotted tomato plants in the rather exceptional event of sporulation having occurred during the latter stage. Seedling infection may come from the soil, or from surface-contaminated seed from plants affected with the fruit rot caused by this fungus, or even from internal seed infection, the author having confirmed Massee's statement (*Kew Bull.*, 1914, pp. 145–146) that the organism can penetrate the seed of infected plants and overwinter in this position.

The stem and branch lesions produced by *A. solani* on tomatoes are less elongated and sunken than the foot rot lesions and resemble the stem symptoms caused by *Phoma destructiva* or the nail head rust fungus, *Macrosporium* [*tomato*: *R.A.M.*, v, p. 598]. Stem infection may result from spores carried from foot rot lesions by insect vectors or raindrops, from contaminated soil splashed on the stems by rain, or from spore inoculum from leaf spot lesions.

The well-known leaf spots produced by *A. solani* are frequently caused by infection from the soil, the organism overwintering in the débris from infected plants in the field, and the attack beginning on the under surface of leaves which have come into contact with wet soil. The fungus fruits abundantly on the leaves.

The blossom blight stage is frequently overlooked, as the calyx symptoms are easily confused with those caused by *Septoria lycopersici*. The zonate, target-spot lesions of *A. solani* appear only on rather large calyx lobes, infection usually beginning near the tips, which die and roll inwards. Many of the blossoms drop off; if not, the entire calyx may be involved, and when the fruit is half grown the infection is found to have reached the point of attachment. This accounts for the fact that more than 90 per cent. of the fruit lesions (termed black rot or hard rot) due to *A. solani* are at or near the stem end of the fruit.

The fruit infections are closely related to blossom blight. Usually the fungus grows directly from the upper surface of the calyx into the torus and on to the fruit surface. Infection may, however, begin on any part of the older fruits. True black rot lesions are

also frequent on the blossom end of fruits which have come into contact with the contaminated field soil.

Fruit drop (due to infection of the fruit pedicels) was first observed in Virginia in 1924, when 10 to 70 per cent. of the plants in all the fields examined were affected, and as much as 35 per cent. of the fruit had already dropped. A strain of *A. solani* isolated from a typical infection was grown in culture and in 1925 successfully reproduced the disease in the field. It may be produced in either of two distinct ways. Passing from the calyx to the fruit, the fungus may attack the tissues at the base of the calyx and to some extent those beneath the torus, and cut the fruit off from its point of attachment. The fungus may also attack the peduncle at the node nearest the fruit, producing a lesion of the stem blight type. This stimulates the abscission tissues and cuts off the fruit and spur. This type of fruit drop, first observed by the author in June, 1926, is very prevalent in Virginia.

Emphasis is laid upon the fact that there are two different life-cycles of early blight, a long or complete cycle beginning in the seed bed, the fungus being introduced in or on the seed or present in the soil, and a short cycle initiated by primary leaf lesions in the field, resulting from soil contact.

Under local conditions, weed hosts of *A. solani* are considered to be unimportant in the spread of early blight of tomato, though *Solanum carolinense* is readily susceptible to inoculation from tomato and is a possible carrier of the disease.

Sansone (F.). **Un avvizzimento del Pomodoro in provincia di Salerno e la sua causa.** [A wilt of Tomato in the province of Salerno and its cause.]—*Boll. R. Staz. Pat. Veg.*, N.S., vii, 4, pp. 465–484, 4 figs., 1927.

In July 1927, the author isolated a species of *Alternaria* [the cultural and morphological characters of which are figured and fully described] from wilted tomato plants growing at Salerno and Pagani, Italy. The leaves were dried up and the stems, though externally sound, broke easily at the nodes. Affected plants bore badly developed fruits, which matured prematurely. A hyaline mycelium was found in the vessels of the base of the stem, and extended up into the branches towards the top of the wilted parts. In culture the fungus formed septate, brown conidiophores, 10·2 to 12 by 3·4 to 5 μ when conidia were freely developed and 27·4 to 37·7 by 3·4 to 6 μ in cultures with poor sporulation. The conidia are catenulate, variable in shape, 55 to 65 by 12 to 18 μ in diameter, with 6 or 7 (seldom 8) transverse, and 1 or 2 longitudinal septa. In contaminated cultures smaller, more rounded conidia, much constricted at the septa, and with very short beaks are produced. Intercalary or terminal chlamydospores were also developed, the former being in chains, subspherical, sometimes bilocular, and 30·8 to 34·3 by 17 μ in diameter, while the terminal chlamydospores were round and single.

The author regards the organism as a form of *A. brassicae* (Berk.) Sacc. [*A. circinans* (B. & C.) Bolle: *R.A.M.*, iv, p. 61].

Notes are also given on a diseased condition of the fruits which was found on nearly all the plants affected by the wilt described

above and also in some plants that were free from the latter. The ripe fruits showed yellow spots on the skin, in the juice underneath which ovoid bacteria were found and successfully isolated.

No inoculation experiments have as yet been carried out with these two suspected pathogens.

DELEVOY (G.). **La fonte des semis ou 'damping off'.** [Melting away or damping-off of seedlings.]—*Bull. Soc. Centr. Forest. Belgique*, xxx, 12, pp. 497–505, 1927.

In this paper the author describes further tests conducted by him at Groenendael, Belgium, during 1926–7, into the relative efficacy of different methods for the control of damping-off of conifer seedlings (Scotch pine, Corsican pine, Douglas fir, spruce, and Japanese larch) [due mainly to *Corticium solani* and species of *Fusarium*: *R.A.M.*, vi, p. 450]. The results obtained [which are tabulated and discussed in considerable detail] are briefly as follows.

Sheltering the plots with straw matting caused injury estimated at 50 per cent. to Scotch pine, 29 per cent. to Corsican pine, and was not very favourable to spruce; but it improved the stand by 17 and 29 per cent. in Douglas fir grown in unmanured and manured beds, respectively.

Marked differences were shown in the effects of different manures. Stable manure slightly increased the injury to Scotch pine, but a mixture of this with basic phosphate and kainit (1,500 and 200 kg. per ha., respectively) gave an improvement of 29 per cent. with this species. With Corsican pine, however, this mixture reduced the stand, although a 6 to 15 mixture of the two mineral fertilizers without stable manure increased the stand when the seed was covered with sawdust [loc. cit.] by 50 per cent. Stable manure also gave 18·6 per cent. increase in Corsican pine, and 18·5 and 60 per cent. in spruce in unsheltered and sheltered beds, respectively, the spruce seedlings being superior to those in beds treated either with the complete mixture (stable and chemical manures) or with the chemical manures only.

The most important effects appear to derive from the kind of covering used for the seed. A sawdust covering, 5 mm. deep, gave a 25 per cent. increase in the stand with Scotch pine and 50 per cent. with Corsican pine, while with spruce this covering, on unmanured and unsheltered beds, gave a 17 per cent. increase over that obtained with a sand covering of the same depth. On manured beds of spruce, sawdust gave results 39 and 9·5 per cent. better than sand in unsheltered and sheltered beds, respectively. Attention is directed to the fact that with spruce and Scotch pine, the sawdust more than compensated for the absence of manure. Fine earth and vegetable mould each gave better but less reliable results than a sand covering.

Soil disinfection was definitely injurious, except when applied 12 days before sowing (3 l. per sq. m.) when the following proved beneficial; 2 per cent. formalin, 0·1 per cent. permanganate of potash, and 0·2 per cent. copper sulphate. With Scotch pine, the copper sulphate gave 31 per cent. improvement, and formalin 26 per cent., while the permanganate of potash increased the number of plants by 15 per cent., but weakened them. With Corsican pine,

0·1 per cent. permanganate of potash with sand covering and mineral manure gave 11·5 per cent. improvement; with Douglas fir, formalin gave 49 per cent. improvement on unsheltered beds, while with spruce it gave 23·7 and 39 per cent. improvement on unsheltered and sheltered beds, respectively. Permanganate of potash gave 14·4 per cent. improvement on unsheltered beds of spruce, while copper sulphate slightly increased the number of sheltered plants.

That soil disinfection may have definite after-effects was indicated by the superior weight of Scotch pine seedlings sown in beds treated in 1925 with formalin, copper sulphate, or permanganate of potash (1240, 1100, and 1028 gm., respectively, per 100 plants, as compared with 807 gm. in the control beds).

Defer (F.). **Modifications de la structure de plantes des tourbières sous l'influence de champignons parasites.** [Modifications in the structure of peat-bog plants due to the action of parasitic fungi.]—Thesis presented to the University of Clermont, 22 pp., 24 figs., Presses Univ. de France, Paris, 1927.

The author refers to the apparent anomaly of the occurrence in peat-bogs and marshes of xerophile plants (with small, narrow, and leathery leaves covered with hairs and with margins rolled outwards, etc.), in explanation of which Schimper in 1898 suggested the theory of the 'physiological dryness' of the medium presented by the acid soil, which reduces the water absorbing power of the plants. Later, Montfort and Stocker controverted this theory, and suggested that the xerophile nature of such plants was rather due to their adaptation to conditions prevailing during the winter in wet and low-lying grounds, e. g. soil frozen for long periods, strong gales that favour a high rate of transpiration, and the like. The author's investigation extended to two plants of this type, *Andromeda polifolia* and *Vaccinium uliginosum*, which are common in peat-bogs and damp meadows in Auvergne and the xerophile nature of which is strongly modified when they are parasitized by *Exobasidium andromedae* and *E. vaccinii*, respectively.

A histological and cytological examination of the parasitized leaves showed that under the action of the parasite they acquire the characters of hygrophile plants, their laminae becoming broader and softer in *A. polifolia*, or thickened in places to wart-like excrescences in *V. uliginosum*. The cuticle on both sides becomes much thinner and is but slightly cutinized. In *A. polifolia* the parasitized plants transpire much more actively than the healthy ones and the parenchyma cells of the leaf are strongly hypertrophied, poor in protoplasm, and almost lacking in chloroplasts, especially in the subepidermal layers. In *V. uliginosum*, besides hypertrophy, the cells also undergo hyperplasy, and in this case also the affected plants lose water much more rapidly than the normal ones. In both plants the fibro-vascular bundles are also much less developed and less lignified than in normal individuals, the cells of the palisade parenchyma become rounded, and there is abundant production of anthocyanin in the epidermal and subepidermal cells.

These bio-morphological modifications in the structure of the leaves under the action of the parasites, as well as the fact that cut branches of parasitized plants wither much more rapidly than those

of healthy plants, indicate in the author's opinion that peat-bog or marsh plants are capable, under stimulation, of absorbing as much water as they need from the soil, thus indirectly confirming Montfort's and Stocker's theory.

VANINE (I. I.). Грибные вредители Хреновского бора Воронежкой губ. поданным обследования в **1926** году. [Fungus diseases of trees in the Khrenovoye Forest of the government of Voronezh in 1926.]—*La Défense des Plantes*, Leningrad, iv, 4–5, pp. 762–770, 1928.

A survey of the Khrenovoye Forest in the government of Voronezh [central Russia] in 1926, showed that young plantations of pines [species not named] suffer chiefly from attacks of *Caeoma pinitorquum*, *Lophodermium pinastri*, *Peridermium pini* f. *acicola*, *P. pini* f. *corticola*, and *Armillaria mellea*, of which the first-named is the most widespread (with an incidence of about 20 per cent.). Older pines were found to be infected chiefly by *Trametes pini* (4 to 10 per cent.) and by *Polyporus schweinitzii* (about 22 per cent.). In regard to the latter it was noticed that the fruiting bodies of the fungus formed for the most part on the ground near the stems, in which case the rot extended upwards into the boles to a height of 2·5 m. In the spring of 1926 from 20 to 30 per cent. of pine seedlings in the experimental nursery attached to the forest were killed by a species of *Fusarium* which was shown to have been carried by the straw with which the plots had been covered during the winter. The fungus caused a soft rot of the roots of the seedlings.

The chief parasites of broad-leaved species were found to be *Fomes igniarius* on oaks, aspens, and black alder [*Alnus glutinosa*]; and *Polyporus dryadeus*, *P. sulphureus*, and *Daedalea quercina* on oaks.

Legislative and administrative measures. France.—*Internat. Bull. of Plant Protect.*, i, 11, pp. 178–179, 1927.

The scope and functions of the 'Service de défense des végétaux' (Plant Protection Service), as the Phytopathological Inspection Service of the French Ministry of Agriculture becomes entitled by a Decree of 30th September, 1927, are defined in the *Journal officiel de la République Française*, lix, 233, pp. 10,416–10,417, 1927. The objects of the service, which is to work in collaboration with the Institute of Agronomic Research, are to ensure (1) the sanitary supervision of plant production and the organization of defence against diseases and organisms harmful to plants and plant products; (2) the phytosanitary control of importations and exportations, the control of the nurseries and other similar establishments exporting products, and the issue of phytosanitary certificates [*R.A.M.*, vii, p. 128]. Each of the 'circonscriptions' into which the country is divided will contain a station for agricultural entomology and one for plant pathology, or similar establishments, and the personnel of the service includes besides the permanent inspectors, a temporary staff of experts and assistants acting as delegates of the 'circonscription', and recruited as occasion requires.

All plants or parts thereof intended for exportation which

require a phytosanitary certificate must be accompanied by a certificate of original good health, to be presented to the officials of the Plant Protection Service at the time of inspection. This certificate, as well as the phytosanitary certificate itself, can only be issued for products derived from crops regularly submitted to State phytosanitary control.

Precautions against spread of fireblight. Regulations governing removal of certain plants and bees from North Island.—*New Zealand Journ. of Agric.*, xxxv, 6, pp. 425–426, 1927.

By an Order in Council dated 7th June, 1927, intended to prevent the further spread of fireblight [*Bacillus amylovorus*] in New Zealand [*R.A.M.*, ii, p. 273; iv, p. 768], no plant of any variety of apple, pear, quince, or hawthorn (*Crataegus*) may be introduced from North Island into any other part of New Zealand unless sent under proper safeguards by an officer of the Department of Agriculture for the identification of disease.

The introduction or dispatch of bees from North Island is forbidden except after six days' quarantine at a specified place immediately before forwarding, when the packages must bear a signed official permit.

Legislative and administrative measures. Mauritius.—*Internat. Bull. Plant Protect.*, ii, 1, p. 10, 1928.

A Proclamation of the Governor of Mauritius, No. 26, of 14th June, 1927, issued in the *Government Gazette*, No. 34 Extraordinary, pp. 241–242, 15th June, 1927, directs that the owners or occupiers of any of the Crown Lands infected or suspected of infection by a species of *Trichosporium* attacking the roots of *Casuarina equisetifolia* [*R.A.M.*, vii, p. 15] shall, on the written instructions of the Director of Forests, cut down, remove, or destroy any *Casuarina* tree affected, or liable to become affected, by this disease.

Legislative and administrative measures. Mexico.—*Internat. Bull. Plant Protect.*, ii, 1, p. 10, 1928.

In order to prevent the introduction of certain fungous diseases of rice, a decree of 12th May, 1927 (issued in the *Diario oficial*, xliii, pp. 5–6, 11th June, 1927), prohibits the importation into the Republic of Mexico of rice and paddy from any foreign country except the United States of America.

Cuarentena exterior num. 7. [Foreign quarantine No. 7.]—*Bol. Mens. Ofic. Def. Agric. Estados Unidos Mexicanos*, i, 7, pp. 536–537, 1927.

This decree, dated 27th December, 1927, absolutely prohibits the importation from any foreign country into Mexico of banana plants or any part thereof, in order to prevent the introduction of Panama disease (*Fusarium cubense*).

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

APPLIED MYCOLOGY

Vol. VII JULY 1928

Fischer (E.). **Etude expérimentale de quelques Urédinées de la région méditerranéenne. II. Gymnosporangium sur Juniperus oxycedrus et phoenicea.** [Experimental study of some Uredinaceae of the Mediterranean region. II. *Gymnosporangium* on *Juniperus oxycedrus* and *J. phoenicea.*]—*Bull. Soc. Hist. Nat. Afrique du Nord*, xviii, 8, pp. 192–196, 1927.

The author investigated two forms of *Gymnosporangium* which he found developing on *Juniperus oxycedrus* and *J. phoenicea*, respectively, in the department of Gard [south of France]. Both forms were shown in inoculation experiments to be pathogenic to *Crataegus oxyacantha*, on which they produced pycnidia followed by the *Roestelia* stage. These results, together with the morphological details of the teleutosori and pycnidia, lead the author to identify both forms as *G. confusum.* A third form, which was occasionally found in the same locality on *J. oxycedrus*, was identified as *G. clavariaeforme*, and was also successfully inoculated on *C. oxyacantha*, on which it caused an incipient formation of witches' brooms.

Sibilia (C.). **Deperimento di pinoli nelle Pine.** [Rotting of the seeds in Pine cones.]—*Boll. R. Staz. Pat. Veg.*, N.S., vii, 4, pp. 454–457, 1927.

In the summer of 1926, at Anagni in Italy the author observed outwardly healthy cones of *Pinus pinea* containing discoloured, powdery seeds, in some of which the kernel was still sound, but in others it was blackened or completely destroyed, its place being taken by a greyish mycelial mat. That the source of infection was external was indicated by the normal germination of sound kernels taken from seeds noticeably affected superficially.

Isolations from diseased material gave a fungus closely resembling *Alternaria tenuis*, of which two forms were found, one with smooth conidia and a greyish-brown mycelium, the other with slightly echinulate conidia and brown or olive-brown hyphae, the dimensions of the conidia were approximately equal in both forms.

NOWOTNY (R.). **Zur Diffusion wasserlöslicher Imprägniermittel im Holze.** [On the diffusion of water-soluble preservatives in wood.]—*Zeitschr. Angew. Chemie*, xli, 2, pp. 46–49, 1 diag., 4 graphs, 1928.

Further technical details are given concerning the diffusion of water-soluble preservatives in treated wood, with particular reference to the Cobra process [*R.A.M.*, vi, p. 764].

WALKER (J. C.) & WELLMAN (F. L.). **A Fusarium-resistant Cabbage of Jersey Wakefield type.**—Abs. in *Phytopath.*, xviii, 1, p. 142, 1928.

Of the progeny of Jersey Wakefield cabbage selected in 1925 from a crop grown on soil infested with yellows (*Fusarium*) [*conglutinans*], all segregated in 1926 in the approximate ratio of 3 resistant to 1 susceptible. In 1927, from 12 selfed progenies tested, 6 were secured which were homozygous for resistance, all showing a complete stand of healthy plants. The remaining 6 again segregated into approximately 3 resistant to 1 susceptible. These results confirm earlier evidence as to the single dominant Mendelian character of *Fusarium* resistance in cabbage.

Mottled heart of Swedes.—*New Zealand Journ. of Agric.*, xxxv, 6, p. 404, 1927.

It is stated that experiments begun during December, 1925, upon the 'mottled heart' disease of swedes, a disease which for many years has been very prevalent in Westland, New Zealand, showed that the ordinary artificial fertilizers, even when increasing the yield per acre, did not reduce the incidence of mottled heart, but that wood ashes, while they produced small increase in yield, decreased or eliminated the disease, according to the quantity used.

FAJARDO (T. G.). **Progress on experimental work with the transmission of Bean mosaic.**—Abs. in *Phytopath.*, xviii, 1, p. 155, 1928.

Bean mosaic [*R.A.M.*, vi, pp. 276, 340] was transmitted to the extent of 80 to 100 per cent. by inoculation with crushed leaf tissues. In 1926 and 1927 field and greenhouse cage experiments with three species of mosaic-reared aphids and mealy bugs gave conclusive evidence of the insect transmission of the disease. Negative results have hitherto been obtained with the other insects tested and also with soil transmission tests. The disease commonly overwinters in infected seed, up to 50 per cent. of mosaic infection having been found in commercial seed of susceptible varieties. Plants grown from diseased seed yielded a higher percentage of infected seed than those inoculated during growth. On uniformly diseased plants there was less mosaic in seed from late than from early set pods.

DUCOMET (V.). **La mosaïque de la Betterave.** [The mosaic disease of the Beet.]—*Rev. Path. Vég. et Ent. Agric.*, xv, 1, pp. 24–29, 2 graphs, 1928.

The results [which are tabulated and expressed graphically] of investigations conducted in the department of the Aisne on two

lines of beets from mosaic-diseased parents showed clearly that in both lines the average sugar content of mosaic-diseased beets was one per cent. less than that of healthy beets (16, as compared with 17 per cent.); their weight, however, remained apparently unaffected.

DRECHSLER (C.). **The occurrence of Aphanomyces cochlioides n.sp. on Sugar Beets in the United States.**—Abs. in *Phytopath.*, xviii, 1, p. 149, 1928.

In June, 1927, *Aphanomyces cochlioides* n.sp. was found to be responsible for more damage to sugar beets through damping-off and root rot in two localities of Michigan than all other organisms combined. The fungus is presumed to be identical with the organism commonly reported from Germany under the name *A. levis* as one of the causes of beet seedling disease, but the oospore walls measure 1·5 to 2 μ in thickness, never 3 to 6 μ as stated by Peters for the German fungus. The oogonial wall measures between 1 and 2·5 μ in thickness and is less prominently sculptured on its inner surface than *A. euteiches* [*R.A.M.*, iv, p. 580]. It further differs from the last-named organism in the frequent flat spiral disposition of the antheridial stalk on the oogonium, while the helicoid involvement of parts described in *A. helicoides* [loc. cit.] is generally absent, though occurring in a form of *A. cochlioides* isolated from oat roots. The relationship of the elements supporting the sexual organs is similar to that of *A. euteiches* and the conspicuously larger *A. raphani* [ibid., vii, p. 4].

McWHORTER (F. P.). **Control of Beet seedling diseases under greenhouse conditions.**—*Virginia Truck Exper. Stat. Bull.* 58, pp. 525–544, 1 fig., 1927.

During 1926–7 the author conducted a comprehensive series of greenhouse tests on the control of the damping-off diseases of garden beet seedlings (Extra Early Egyptian variety) associated chiefly with *Phoma betae* and *Corticium vagum* var. *solani* [*C. solani*] [*R.A.M.*, vi, p. 709]. These diseases are very severe in eastern Virginia, where the seedlings are grown at relatively high temperatures.

As temperature was considered by some growers to be the chief predisposing cause of seedling loss, a pot test was carried out which showed that at a mean soil temperature of 70° F. one hundred seed-clusters gave an average stand of 9 plants, as compared with 131 plants when the soil temperature was kept at 56°. It was also shown that planting wet seeds and keeping the soil wet until germination begins is essential to optimum germination, though enormous losses result from keeping the beds damp after germination.

Beet seed was found not to be tolerant to formalin, but when the seeds were immersed for 3½ hours in 0·25 per cent. uspulun less than one per cent. of the seedlings died after 19 days, as compared with about 42 per cent. in the control treated by immersion in water only. Immersion in uspulun for 3 hours 10 minutes gave about 30 times as many seedlings as were obtained from the same amount of untreated seed, but where the soil had previously been

planted with beets and where a virulent strain of *Rhizoctonia* was introduced, the stand was not quite three times as good as the control. Seeds immersed for 3 hours 50 minutes in uspulun and planted in clean soil kept at 60° to 65° showed 5 diseased plants in 10 days, as compared with 53 and 229 in the dry and wet control beds of equal size, respectively.

Experiments with seeds darkened chiefly owing to the presence of an undetermined species of *Stemphylium* showed that untreated light-coloured seed gave better stands than treated dark seed, and that the best stands were obtained from light seed treated with uspulun or semesan. The germination of the light seed was 30 per cent. and the stand 85·7 per cent. better than those of the dark seed. Uspulun treatment increased both the germination and stand of the dark seed but the stand only of the light seed.

Three large demonstration plantings were made under commercial greenhouse conditions, after 3½ hours' immersion of the seed in 0·25 per cent. uspulun. Excellent stands were obtained throughout, and in one planting not more than 1·5 per cent. of the seedlings died, while even in the poorest stand more than 90 per cent. of the plants survived. To test the safety of the treatment 110 seed-clusters were soaked in 0·25 per cent. uspulun at approximately 20° C. [68° F.] for 54 hours; no fewer than 58 clusters germinated, while the 3½ hours' treatment apparently caused no injury whatever.

The best and second-best stands recorded in this bulletin were obtained after 3½ hours' seed immersion in 0·25 per cent. uspulun and semesan, respectively. Other treatments tested did not give satisfactory control or injured the seed.

The author considers that control depends almost entirely on disinfection, not on protection, and that it is effective only while the seedlings are young.

The following general directions for the control of beet seed-bed diseases are given. The soil used should not previously have been planted to beets, or be heavily manured, and should have a nearly neutral reaction. The seed should be immersed for 3½ hours in 0·25 per cent. uspulun or semesan at 60° F., ½ oz. of the disinfectant and 1½ gall. of water being used to every lb. of seed. The soil should be wet when the seeds are sown, be well watered immediately afterwards, and kept moist until germination begins. During the first fortnight after germination the beds should not be heavily watered, the greenhouse should be well ventilated, and the soil maintained at 55° to 60° F.

KÜSTER (A.). **Rübenbeizen gegen Wurzelbrand.** [Beet disinfection against root rot.]—*Deutsche Landw. Presse*, liv, 49, p. 688, 1927.

A short account is given of the serious effects produced on German sugar beet crops by root rot or blackleg (*Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*) [*R.A.M.*, vi, pp. 648, 649]. The results of three years' observations at the Biologische Reichsanstalt are stated to show that these organisms occur in infected plants approximately in the ratio of 7 : 4 : 2. Owing to the difficulties involved in the liquid method of disinfection, the

treatment of beet seed-clusters has hitherto been widely neglected in Germany. Excellent results, however, having now been obtained by seed disinfection with the highly effective dusts, tillantin and tillantin R, it is hoped that this method of control will be generally adopted.

COONS (G. H.). **Cercospora leaf spot of the Sugar Beet.**—*Planter and Sugar Manufacturer*, lxxix, 24, pp. 466–467, 1927.

The author describes in popular terms the symptoms, effects, and mode of infection of leaf spot of sugar beet (*Cercospora beticola*) [*R.A.M.*, vii, p. 72], and states that the best method of control at present available consists in allowing an interval of several years between successive beet crops, in order that they may not be exposed to infectious material from the old beet tops. Properly situated, well drained fields should also be selected.

WIERINGA (K. T.). **Over een bacterieziekte in Bieten.** [On a bacterial disease of Beets.]—*Nederl. Tijdschr. Hygiëne, Microbiol. en Serol.* (*Leiden*), Deel 2, 2, pp. 149–152, 2 pl., 1927.

A black discoloration of the parenchyma between the vascular bundles of Rosé Jaapjes fodder beets from northern Holland was examined in October, 1926. The condition (locally known as ring rot) was not apparent in the field or on lifting, and was first detected when the beets were cut.

A rod-shaped, motile, non-spore-forming, Gram-negative bacterium, measuring 2 by $0{\cdot}5\,\mu$, and furnished with 1 to 5 polar flagella, was isolated from the diseased tissues and cultured on meat bouillon agar. The colonies are smooth, spherical, white to greyish, and markedly fluorescent in the presence of calcium lactate, butyrate, acetate, or mannite, and also on gelatine. No gas is formed from sugars, and nitrates are not reduced; milk is dissolved in five days but not coagulated. The best growth on meat bouillon agar is made at 28° to 30° C., the minimum and maximum temperatures for development being 0° to 4° and over 37°, respectively, while ten minutes' exposure to a temperature of 45° destroys the organism. On the basis of these characters the organism is determined as a *Phytomonas*, to which the name *P. betae* is given.

Inoculation experiments on Golden Tankard and some twelve other varieties of fodder and sugar beets with pure cultures of this organism gave positive results. Black rings were formed in the parenchyma within a week, infection spreading primarily in a horizontal direction. After two to three weeks the discoloration covered an area of several centimetres both in a horizontal and a vertical direction. Attempts to produce similar effects with other soil- and water-inhabiting organisms gave negative results. The dark reddish-brown discoloration of the infected beets is attributed to the liberation of oxidases in the cells killed by *P. betae*.

HELM (A.). **Der Sellerieschorf.** [Celery scab.]—*Gartenwelt*, xxxii, 4, p. 50, 1 fig., 1928.

This is a very brief note on a disease of the root-stocks of celery [apparently of the celeriac type] caused by *Phoma apiicola* [*R.A.M.*, vi, p. 141], which is stated to be responsible for heavy losses, espe-

cially during storage. Crop rotation is the most important control measure, since the causal organism persists in the soil, but thorough sanitation and seed disinfection should also be practised.

Die Sklerotienkrankheit des Spargels. [The sclerotial disease of Asparagus.]—*Obst- und Gemüsebau*, lxxiv, 1, p. 11, 1928.

An asparagus disease characterized by a yellowish or grey discoloration of the head, accompanied by the desiccation of the second and following shoots, was ascertained to be due to the sclerotial stage of *Botrytis cinerea*. This is believed to be the first record of the disease in Germany, though *Sclerotinia libertiana* [*S. sclerotiorum*] is known to occur on asparagus in the United States, where spraying with Bordeaux mixture is recommended as a control measure.

THOMPSON (R. C.). **Tipburn of Lettuce.**—*Colorado Agric. Exper. Stat. Bull.* 311, 31 pp., 5 figs., 1926. [Received 1928.]

The results of the author's investigations on the etiology of tipburn of New York lettuce [*R.A.M.*, v, pp. 531, 532] showed that plants with a high sugar content are more resistant to the disease than those with a low one. The ratio of the total monosaccharide sugars to total disaccharide and polysaccharide sugars was found to be greater in susceptible than in resistant plants, and the former were also usually more succulent than the latter. The development of tipburn was shown to be favoured by excessive irrigation, but no evidence was obtained that the loss of water through rapid transpiration is a factor in the causation of the disease. Tipburn is most prevalent in a humid atmosphere at a temperature near 70° F., and occurs primarily on turgid leaves. Nearly all the burning was found to take place in darkness and under conditions favouring active respiration. Tipburn would appear from these researches to be due to the excessive accumulation of respiratory products. All measures tending to reduce the growth of the plants will simultaneously decrease their liability to the disease.

PORTER (D. R.). **Studies with the Watermelon wilt, caused by Fusarium niveum E.F.S.**—Abs. in *Phytopath.*, xviii, 1, pp. 143–144, 1928.

Fusarium niveum [*R.A.M.*, vi, p. 458], which may enter watermelons through root hairs, wounds, and the epidermis of the hypocotyl, produces four pathological conditions on seedlings: (1) failure of the seedlings to emerge after germination; (2) necrosis of the cortical tissues at the soil surface causing the seedlings to fall over; (3) stunting; and (4) wilting, yellowing of the cotyledons, and eventual death. The organism grows most rapidly on potato dextrose agar between 24° and 32° C., its minimum being above 8° and its maximum above 35°. It grows rapidly on a wide range of acid and alkaline media (P_H 3 to 8·4). Viability is maintained for 20 days in an oxygen-free chamber. *F. niveum* has been isolated from watermelon seeds secured from various localities and directly from seeds taken from fruits attached to wilted vines. Cultures of the fungus from five States seem equally pathogenic to seedlings though differing slightly in physiological reactions in culture. Infection

in the field occurs most rapidly when seeds are planted about half-an-inch above the inoculum.

PORTER (D. R.). **Varietal resistance of Watermelons to wilt (Fusarium niveum E.F.S.).**—Abs. in *Phytopath.*, xviii, 1, p. 144, 1928.

Four of the 13 selections of Chinese watermelons tested in 1927 for their reaction to wilt (*Fusarium niveum*) [see preceding abstract] on severely infested soil in Iowa appeared to possess some degree of resistance (25, 28, 29, and 39 per cent., respectively, compared with 100 per cent. infection in the controls). The preserving citron [*Citrullus vulgaris* var.] was 82 per cent. resistant and two selections from African forage melons apparently immune. The Conqueror variety was the most resistant of the commercial types tested but usually succumbs in time. First generation hybrids appear to be as susceptible as the susceptible parent, while resistance in the F_2 varies with the resistant parent. African hybrids were found to be much more resistant in the F_2 generation than those of the Conqueror variety. The flesh quality of the resistant parent seems to be dominant in the F_2 generation.

PORTER (R. H.). **Further evidence of resistance to Cucumber mosaic in the Chinese Cucumber.**—Abs. in *Phytopath.*, xviii, 1, p. 143, 1928.

None of the 200 cucumber plants of the Chinese Long variety inoculated in July, 1927, with the mosaic virus developed mosaic, which occurred, however, in 75 per cent. of the American White Spine variety used in the same test. The incidence of mosaic due to natural infection in three rows of White Spine plants grown from seed planted in hills was about 50 per cent., while no symptoms developed in $2\frac{1}{2}$ rows planted with seed of the Chinese variety. All the plants in this field were dusted while young with calcium arsenate and lime to restrict the injury from beetles, but no attempt was made to control plant lice.

WEBER (G. F.). **Cucumber fruit-rot and angular leaf-spot.**—Abs. in *Phytopath.*, xviii, 1, p. 133, 1928.

The results of five years' observations in Florida have shown that angular leaf spot of cucumbers (*Bacterium lacrymans*) [*R.A.M.*, ii, p. 196] may or may not be accompanied by fruit rot, but that fruit rot is always associated with angular leaf spot. Ten minutes' immersion of the seed in 1 in 1,000 corrosive sublimate reduced the incidence of infection from 75 per cent. to nil. Cucumber leaves and fruit were inoculated with the two strains isolated from the leaves and fruits, respectively. Both strains produced the typical fruit rot and angular spot on the leaves, thus showing (in view also of their similarity in culture) that they must be regarded as a single species.

GUERCINI (A.). **Oggi: Tartufi!** [Truffles to-day!]—*Il Coltivatore*, lxxiii, 34, pp. 501–506, 1927.

As the Italian production of truffles amounts approximately to only one twenty-fifth of the French, the author recommends

putting the industry on a commercial basis, and briefly describes the cultural methods, particularly the planting of oaks and poplars (on the roots of which they live in symbiosis), which should be adopted. The distribution of the various species of *Tuber* used as truffles in Italy is briefly indicated and instructions are given for their establishment in new groves. One hectare of truffle beds should yield 105 to 112 kg. annually, representing a return of 10,500 to 11,200 lire [roughly £46 to £48 per acre].

De Castella (F.). **Sulphuring and spraying Vines.**—*Journ. Dept. Agric. Victoria*, xxv, 12, pp. 732–735, 1927.

This note, written in popular language, is a warning to the local vine-growers of the necessity of treating their vines for the control of various fungous diseases and insect pests. The chief diseases of the vine in Victoria are stated to be *Oidium* (*Uncinula spiralis*) [*U. necator*], downy mildew [*Plasmopara viticola*], and black spot or anthracnose [*Gloeosporium ampelophagum*]. Some recommendations are made for the preparation and application of Bordeaux mixture, and also in regard to dusting the vines with sulphur.

Ravaz (L.). **Chronique: Le mildiou sur Noah.** [Current events: mildew on Noah Vines.]—*Prog. Agric. et Vitic.*, lxxxviii, 49, pp. 539–540, 1927.

During 1927, vines of the Noah variety (a cross between *Vitis riparia* and *V. labrusca*) in the department of Vendée were extensively attacked by mildew [*Plasmopara viticola*], which is not uncommon on Noah, Clinton, and hybrids of the same group, and attacks all American vines, though *V. cordifolia* and *V. riparia* are very slightly affected.

The attacks on Noah and allied varieties appear as small, irregular spots on the leaves, which usually cause no appreciable injury to the health of the plants. The Labrusca parent is less resistant, bearing spots up to 2 cm. in diameter.

Reichert (I.). **Downy mildew (Plasmopara viticola) of the Vine in Palestine.**—*Yedeoth* (*Proc. Zionist Agric. Exper. Stat.*), vii–viii, pp. 349–351, 1927. [Hebrew, with English summary.]

Downy mildew of the vine (*Plasmopara viticola*) is thought to have been introduced into Palestine with the first vines imported from France in 1883. The disease occurs only in the coastal plain, where the relative humidity of the air during the period of infection exceeds 70 per cent. The vines in the Jordan Valley, and in the vicinity of Jerusalem and Hebron, where the relative humidity fluctuates between 46·5 and 58·5 per cent., are not affected. Another factor explaining the absence of the disease in the Jordan Valley is the prevailing high temperature (over 30° C.), which is beyond the maximum for conidial germination and the infection of the foliage.

The losses incurred as a result of downy mildew vary according to the meteorological conditions in different seasons. Easterly winds are the primary factor in the prevention of infection, which may be very heavy in years when the prevailing wind is from the west, as was the case during the epidemic of 1906. In normal

seasons only the leaves are attacked, but in severe cases the berries may also be infected.

The symptoms of downy mildew are described and notes are given on two other diseases with which it may be confused, namely, those caused by *Uncinula necator* and the mite *Eriophyes vitis*. Oospores were not found in the material examined during 1927, when the following varieties were heavily attacked: Alicante, Bordelaux, Carignan, two Muscats, and the native Chevroni. A high degree of resistance was shown by the local variety Salti and the Damascus varieties Seni, Chelowani, Beledi, and Asuad, as well as by three imported ones, viz., Grande Rosette, Dodrelabi, and Black Monoco.

On the grounds of the above-mentioned data the writer concludes that spraying is necessary only in the coastal plain. Instructions are given for the preparation and application of Bordeaux and Burgundy mixtures, with notes on the comparative merits of each, as well as on the use of kurtakol and nosperal. Emphasis is laid on the necessity of treating both sides of the leaves, and directions are given for the determination of the correct spraying period on the basis of Müller's and Rabanus's incubation graph (*Weinbau und Kellerwirtsch.*, ii, p. 65, 1923).

SOURSAC (L.). **Observations sur le court-noué de la Vigne.** [Observations on court-noué of the Vine.]—*Prog. Agric. et Vitic.*, lxxxviii, 50, pp. 573–575, 1927.

In this paper the author reports that greatly increased yields were obtained from two vines which had long been affected with court-noué [*R.A.M.*, vi, pp. 334, 655], by removing the suckers from one of the vines, and by training the branches of the other vertically, to reduce the growth of offshoots.

VAN POETEREN (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1926.** [Report on the activities of the Phytopathological Service in the year 1926.]—*Verslag en Meded. Plantenziektenkundigen Dienst te Wageningen*, 51, 100 pp., 6 pl., 1 map, 1928.

Among the numerous interesting records in this report, prepared on similar lines to those of previous years [*R.A.M.*, vi, p. 461], the following may be mentioned. *Phoma hennebergii* [*Septoria nodorum*: ibid., vii, p. 147] was observed causing a brown discoloration of wheat glumes. In severe cases (occurring chiefly in wet weather) the fungus may prevent the formation of grain.

P. tuberosa [ibid., v, p. 469] was detected for the first time on Eigenheimer potatoes showing dark, somewhat sunken spots bearing the pycnidia of the fungus. Infection was restricted to tubers lifted mechanically in September, suggesting that admission is gained through wounds. Some of the diseased tubers were planted out and yielded perfectly healthy progeny.

A black discoloration of the parenchyma between the vascular bundles of some sugar beets received from northern Holland was attributed to infection by a bacterium which has been named *Phytomonas betae* [see above, p. 421]. The roots of spinach plants

showing a yellow discoloration and white spotting of the leaves were found to contain the so-called X-organisms [ibid., iii, p. 421], the exact nature and rôle of which has not yet been determined.

A new disease of tomatoes, apparently of bacterial origin, was reported from two localities. One or more yellowish-brown spots developed on the stems and caused the death in a few days, either of the entire plant or of the portion above the seat of injury. The spread of infection was arrested by sanitary measures, assisted by improved weather conditions.

For several years Star apple trees at Limburg have been suffering from a disease which appears, as a result of recent investigations, to be connected with the water-content of the soil. *Phyllosticta mali* has been isolated several times from the leaves of affected trees [ibid., iv, p. 589], but is not believed to be the primary cause of the condition.

Gooseberry bushes in Friesland showed a dark spotting of the shoots and fruits. Inoculation experiments on plucked berries with the dark grey mycelium of a *Macrosporium* isolated from the lesions resulted in the development of typical spots. This disease appears to be increasing in prevalence.

A commission of experts, representing a number of scientific institutions, has been formed to deal with the problem of the elm disease, the etiology of which still remains obscure. Further investigations in connexion with this important matter are to be undertaken at the Baarn Phytopathological Institute. So far all attempts to improve the state of the trees by the application of manganese sulphate or by Ilisch's immunization method [ibid., vii, p. 67] have given negative results.

Douglas firs [*Pseudotsuga taxifolia*] examined by Dr. M. Wilson were found to be attacked by *Phomopsis pseudotsugae* [ibid., vi, p. 259], which was kept within bounds by the removal and destruction of infected material. Young conifers at Boskoop, especially a variety of *Chamaecyparis lawsoniana*, were attacked by a root rot which appeared to be primarily due to waterlogging of the soil. *Pestalozzia funerea* [ibid., v, p. 391] and a species of *Fusarium* isolated from diseased material are regarded as of secondary importance.

Laburnum branches at Vierhouten were attacked with unusual severity by *Camarosporium laburni*. A species of *Dothiorella* was isolated from the dead branches of box (*Buxus*) plants at Utrecht and Aalsmeer. Sweet peas (*Lathyrus odoratus*) displayed symptoms closely resembling those described by Dowson [ibid., iv, p. 651] as due to *Cladosporium album*. A number of orchids (*Odontoglossum grande*) imported from Guatemala in 1920 suddenly developed a brown discoloration and decay of the shoots, which prevented the formation of roots and interfered with flowering. Microscopic examination revealed the presence of a fungus apparently identical with *Moniliopsis aderholdi*, which was not transmissible to potatoes, and is therefore to be regarded as distinct from *Rhizoctonia* [*Corticium*] *solani* [ibid., v, p. 193]. The carnation disease ascribed in 1924 to a species of *Septogloeum* is now believed to be identical with that reported from Germany [and England] as due to *Pseudodiscosia dianthi* [ibid., vi, p. 554]. The outer scales of L'Innocence

hyacinth bulbs showed circular, sunken, purplish spots produced by *Cladosporium fasciculare,* not hitherto known in Holland.

The section on experiments and investigations (pp. 59–90) contains reports on a number of tests for the control of various important diseases.

Die Bayerische Landesanstalt für Pflanzenbau und Pflanzenschutz 1902–1927. [The Bavarian State Institute of Agriculture and Plant Protection 1902–1927.]—Reprinted from *Landw. Jahrb. für Bayern, 1927,* 7–8–9, 206 pp., 2 diags., 3 graphs. [1928.]

The first part of this special publication, issued to commemorate the twenty-fifth anniversary, on 1st October, 1927, of the Bavarian State Institute of Agriculture and Plant Protection, deals with the history, organization, and internal and external activities of the institution ; while the second comprises articles by technical experts on the more important phases of the scientific work carried out during the period under review.

In the section on seed disinfection by Dr. E. Hiltner (pp. 78–101), the development of this aspect of plant protection is reviewed from 1886 onwards, with special reference to the work of L. Hiltner in connexion with mercurial fungicides. On pp. 107–118 Dr. K. Flachs gives a survey of the principal fungous and insect pests attacking economic and ornamental plants in Bavaria, and of the measures which have been devised for their control. Some of the more recent work referred to in both these sections has been noticed in this *Review.*

Rothers (B. V.). Очерк болезней растений в Сочинском округе. [Outline of plant diseases in the district of Sotchi.]—*La Défense des Plantes,* Leningrad, iv, 6, pp. 962–967, 1928.

This list gives an enumeration of, and brief notes on, the most important plant diseases noticed by the author in the district of Sotchi [Caucasian littoral of the Black Sea], among which five are caused by new species of fungi, Latin diagnoses of which are appended. The following are of interest. Apple leaves were affected by spots caused by *Phyllosticta briardi* and *Pestalozzia breviseta.* Cherry (*Prunus cerasus* and *P. avium*) suffered from the leaf spot caused by *Cercospora cerasella.* Figs developed dark brown, irregular spots on the leaves, which were caused by *Phyllosticta fici-carici* n. sp. ; the pycnidia of the fungus are rounded, from 90 to 150 μ in diameter, and the stylospores are hyaline, oblong-oval or occasionally irregular, and measure 5 to 9 by 3 to 4 μ. Japanese medlar (*Mespilus* [*Eriobotrya*] *japonica*) was attacked by leaf and fruit scab (*Fusicladium* [*dendriticum* var.] *eriobotryae*) and leaf spot (*P. eriobotryae*). Quince leaves were affected by *Hendersonia foliorum*; pears by white leaf spot (*Septoria piricola*) [*Mycosphaerella sentina*], brown leaf spot (*P. pirina*), powdery mildew (*Oidium farinosum*), and sooty mould (*Capnodium* sp.) ; tangerines by the leaf spot due to *P. disciformis*; *Cinnamomum camphora* by that caused by *P. cinnamomi-glandulifera* ; and

Gingko biloba by leaf spots caused by *P. gingko*, *H. foliorum*, and *Leptothyrium nervisequium* n. sp. The last-named fungus forms on the leaves irregular, brown spots; the pycnidia are scutate, black, round, or elongated, generally disposed along the veins on the under side of the leaves; the stylospores are hyaline, fusiform, and 6 to 9 by 2 to 3 μ in diameter. Oak leaves were attacked by powdery mildew (*Oidium dubium*) [*Microsphaera quercina*] and leaf spot (*Septoria quercina*); besides a second leaf spot (on *Quercus sessiliflora*) caused by *P. grandispora* n. sp. This fungus forms brown spots with a darker margin; its pycnidia are from 95 to 190 μ in diameter, and the hyaline, ellipsoidal stylospores measure 15 to 20 by 6 to 8 μ. On onion a leaf spot caused by *P. allii* n. sp. was found. It forms at first white spots with a dark margin, which then coalesce and extend over the greater portion of the leaf; the pycnidia are globose, 84 μ in diameter, and contain hyaline, ovoid stylospores measuring 5·6 by 2·8 μ. Parsley was found affected by a light brown leaf spot caused by *P. petroselini* n. sp., the pycnidia of which are rounded, immersed, 84 to 125 by 84 μ in diameter, and contain hyaline, cylindrical stylospores with rounded ends, and 5 to 9 by 2·5 to 3 μ in diameter. *Dolichos sinensis* was attacked by a leaf spot caused by *P. dolichi*, and *Lolium perenne* by a wilt caused by *Gloeosporium graminis*.

A year's progress in solving farm problems of Illinois. 1926–27. —*Fortieth Ann. Rept. for year ended June 30, 1927*, 288 pp., 26 figs., 22 graphs, 5 maps, 1927. [Received May, 1928.]

This report contains, *inter alia*, the following references of phytopathological interest. The losses caused by the ear rot diseases of maize in Illinois were estimated at nearly 15 per cent. in 1926 as compared with less than 9 per cent. in 1924 [*R.A.M.*, vi, p. 598]. *Diplodia zeae* and *Gibberella saubinetii* cause a progressive rot beginning either at the tip or the butt and all the kernels are rotted as infection spreads over the ear. *Fusarium moniliforme* [*G. moniliformis*] generally causes a scattered rot, sometimes involving the entire ear [ibid., vii, p. 160], while *Basisporium gallarum* [*Nigrospora sphaerica*: ibid., vi, p. 758] is responsible for many chaffy ears. All these organisms are also important causes of seedling blight or root rot, but the two types of decay are quite distinct, ear rot infection occurring only through wind-blown spores and not by seedling infection.

The results of investigations [details of which are given] indicate that infection with the three first-named fungi may occur through the silk without the husks being opened or the ear exposed, though under the latter condition contamination is more rapid. Inoculation with *G. moniliformis* and *G. saubinetii* on the silk or tip was most effective on 10th August and entirely ineffective on 30th August. Similar inoculations with *D. zeae*, however, were highly effective during the whole of the period between these two dates. It was further ascertained that infection with *D. zeae* occurs readily through the shank, while *G. moniliformis* and *G. saubinetii* are unable to cause this type of infection easily, if at all.

In experiments on the control of these diseases a significant

increase of yield was obtained by dusting the seed-grain with Bayer dust (3 oz. per bushel), while $1\frac{1}{2}$ hours' immersion in 0·5 per cent. uspulun caused a uniform decrease.

A few pear trees of two Chinese species have remained immune from blight [*Bacillus amylovorus*] during two seasons of heavy infection. The fruit is of inferior quality and the trees are intended primarily for breeding purposes. Blight hold-over cankers on Willow Twig apple trees in western Illinois led to heavy infection in 1926, and no benefit was derived from applications of lime-sulphur, scalecide, or oil emulsion.

The incidence of blister canker of apples [*Nummularia discreta*] continues to decline as a result of the systematic excision of the cankers. The results of two years' observations in a number of orchards show that the great majority of infections occur through ragged wounds, such as those produced by the breaking of branches overloaded with fruit. Such wounds should be carefully treated so as to give a smooth surface on which no moisture can collect [ibid., vi, p. 491].

Bacterial spot of peach [*Bacterium pruni*] was unusually severe in southern Illinois during 1926. Nitrogenous fertilizers assisted the trees to recover from the disease, and spraying with sodium silicofluoride again controlled infection [ibid., vi, p. 425]. This compound, however, caused premature ripening of the fruit and some foliage injury. Promising results were also given by a colloidal sulphur spray.

A number of native gooseberry varieties specially selected for their supposed resistance to leaf spot [*Mycosphaerella grossulariae*] were found to show 4 to 5 per cent. infection, while some of Canadian origin exhibited up to 22·5 per cent. The Minnesota varieties, Carrie and Como, showed 34 and 45 per cent. infection, respectively, while 46 per cent. of the leaves of the new standard Poorman variety were diseased. Most of the so-called English gooseberries showed heavier infection, ranging from 60 per cent. on Portage to 78 per cent. on White Smith. Downing and Oregon Champion, two standard sorts, showed 79 and 85 per cent. infection, respectively.

Fifty raspberry seedlings selected for resistance to anthracnose [*Plectodiscella veneta*: ibid., vi, p. 566] are considered to be suitable for further study under commercial conditions. Sulphur and bleaching powder, applied to the soil in varying quantities, gave better control of crown gall of Cuthbert raspberries [*Bact. tumefaciens*: loc. cit.] than limestone or air-slaked lime, but the results of these experiments are not altogether conclusive.

In a series of tests to determine the relative productivity of the standard tomato varieties, Bonny Best and Grand Rapids, and four strains resistant to wilt (*Fusarium*) [*lycopersici*], the latter outyielded the former in first-grade fruit on wilt-inoculated soils, except for the spring planting of Bonny Best, which was outyielded by Marglobe only. This variety, together with Louisiana Pink, gave the highest yields under all conditions. Grand Rapids was less susceptible to wilt than Bonny Best, and has been crossed with each of the wilt-resistant varieties in the hope of securing a a hybrid combining the good qualities of both parents.

SACKETT (W. G.). **Report of Bacteriologist.**—*Fortieth Ann. Rept. Colorado Agric. Exper. Stat. for the year 1927*, pp. 20–24, 1927. [Received April, 1928.]

This report contains the following references of phytopathological interest. Bacteriosis of beans [*Bacterium phaseoli*] in the Arkansas Valley caused extremely heavy damage, and in some cases the canning factories rejected all the string beans offered. The use of three-year-old seed effected a considerable reduction in the incidence of infection, while in some varieties the results with two-year-old seed were almost equally good [*R.A.M.*, vi, p. 338].

Onions on the Western Slope were attacked by *Bacillus carotovorus*, causing a soft rot of the neck, accompanied by premature blanching and falling over of the tops.

A serious reduction in the germination of pea seed was caused by bacterial infection [? *Pseudomonas pisi*: ibid., vii, p. 214].

Crown gall.—*Min. of Agric. Leaflet* 245, 8 pp., 4 pl., re-written January, 1928.

A brief, popular account is given in this leaflet of the history, host range, and symptomology of crown gall of various plants caused by *Bacterium tumefaciens*. Measures tending to the prevention of the disease by soil disinfection and the avoidance of wounding the hosts are also briefly discussed, and some notes are given on the comparative susceptibility to the organism of fruit tree stocks.

BANFIELD (W. M.). **Studies on the life history of the crowngall organism.**—Abs. in *Phytopath.*, xviii, 1, pp. 128–129, 1928.

Bacterium tumefaciens has been found in very large numbers in tissue removed aseptically from the interior of crown galls on raspberries, and in many cases masses of bacteria have been observed on the surface of the galls. They have further been obtained in considerable numbers from water in which galls had been immersed for a short time. The pathogen has been found to live in different types of unsterilized soil for periods varying from a few months to over a year, and to overwinter in soil in the field at Madison, Wisconsin. The results of experiments on healthy plants indicated that both the prevalence of chewing insects and the growth characters of certain raspberry varieties may be important factors in the causation of infection.

PATEL (M. K.). **Longevity of Pseudomonas tumefaciens Sm. & Town. in various soils.**—Abs. in *Phytopath.*, xviii, 1, p. 129, 1928.

Pseudomonas [*Bacterium*] *tumefaciens* was reisolated after 16 months from sterilized clay, loam, and quartz sand artificially infested in the laboratory [*R.A.M.*, v, p. 495]. Pure cultures of the pathogen were also obtained from non-sterilized infested sand after 16 months and from clay and loam after 14 months. The sterilized and unsterilized samples of infested loam kept in the open from October to March yielded virulent cultures of *Bact. tumefaciens*. The samples of sterilized and unsterilized infested clay, loam, and quartz sand, after being buried 12 inches in the soil from November to March, still gave pathogenic cultures of the crown gall bacteria.

Field loam soils infested in the late autumn with a 72-hour-old broth culture of the pathogen and finely chopped tomato galls yielded the crown gall organism in the following March.

Patel (M. K.). **Strains of Pseudomonas tumefaciens Sm. & Town. and their prevalence in various soils.**—Abs. in *Phytopath.*, xviii, 1, pp. 129–130, 1928.

Fifteen non-pathogenic lines and one pathogenic strain of *Pseudomonas* [*Bacterium*] *tumefaciens* [see preceding abstract] gave practically the same titre when tri- and tetravalent salts were used in agglutination tests. Six of the non-pathogenic strains and the pathogenic one had one to three polar flagella. The pathogenic strain always produced crown galls on sweet peas, garden peas, oleander [*Nerium oleander*], *Bryophyllum*, raspberries, apples, and weeping willow [*Salix babylonica*], while the non-pathogenic ones caused no injury on these hosts.

One pathogenic strain identical in all other respects with certain other pathogenic ones lost its virulence after two years' culture on a common medium. Organisms resembling *Bact. tumefaciens* were obtained on crystal violet bile medium [*R.A.M.*, vi, p. 19] from 41 out of 96 soil samples from nine States. Seven of these organisms were pathogenic to tomato. Repeated isolations from water and air yielded no colonies resembling *Bact. tumefaciens.*

Hill (J. B.). **The method and rate of migration of Bacterium tumefaciens in Tomato.**—Abs. in *Phytopath.*, xviii, 1, p. 129, 1928.

The examination of healthy young tomato stems inoculated with *Bacterium tumefaciens* showed that, within three hours after infection, the bacteria migrate as zoogloeae or zoogloeal strands through the intercellular spaces of the pith and subepidermal chlorophyllous parenchyma. The zoogloeae apparently consist of a semi-fluid gelatinous matrix densely packed with bacteria. The zoogloeal strands may be unbroken for from 0·35 to 0·56 mm., and continuous but for slight interruptions for much greater distances. Working with over 80 zoogloeae, the writer calculated the rate of movement of these bodies at 0·04 mm. per minute for the first 15 minutes and approximately 0·03 mm. per minute for three hours.

Winge (Ö.). **Cytologische Untersuchungen über die Natur maligner Tumoren. I. 'Crown gall' der Zuckerrübe.** [Cytological investigations on the nature of malignant tumours. I. Crown gall of the Sugar Beet.]—*Zeitschr. Zellforsch. und mikroskop. Anat.*, vi, 3, pp. 397–423, 1927. [Abs. in *Zeitschr. für Krebsforsch.* (*Referatenteil*), xxvi, 4, p. 54, 1928.]

The examination of naturally occurring crown galls and those induced by inoculation with *Bacterium tumefaciens* on sugar beets showed an abnormally large number of chromosomes in the nuclei of the tumour cells (36 instead of 18, or even, in some cases, 72 or more). Reduction in this abnormally increased number of chromosomes may apparently occur, since diploid as well as tetraploid nuclei were found in the tumour tissues.

ANDERSON (H. W.). **Bacteriophage of Bacterium pruni.**—Abs. in *Phytopath.*, xviii, 1, p. 144, 1928.

A bacteriophage of high potency was obtained by ten successive filtrations from soil beneath peach trees infected with *Bacterium pruni.* A stock supply capable of clearing turbid suspensions of *Bact. pruni* when diluted to 10^{-6} or 10^{-10} was finally secured. Typical plaques were obtained with high dilutions on agar plates but secondary cultures almost always appeared in several days. One attempt to isolate a bacteriophage from old infected peach leaves was unsuccessful.

LEVINE (M. N.). **Biometrical studies on the variation of physiologic forms of Puccinia graminis tritici and the effects of ecological factors on the susceptibility of Wheat varieties.**—*Phytopath.*, xviii, 1, pp. 7–123, 1 pl., 35 graphs, 1 diag., 1 map, 1928.

In experiments with 19 different physiological forms of *Puccinia graminis tritici* isolated from rusted wheat grown under uniform conditions in rust nurseries at 34 centres in the United States and Canada between 1919 and 1923 [*R.A.M.*, ii, p. 158; v, p. 219], the writer found that all the forms except two attacked all the hard red spring varieties under greenhouse conditions. Marquis was resistant to one of the two excepted forms and Kota to the other. Two of the physiological forms infected Vernal emmer normally under greenhouse conditions, but Khapli was not appreciably affected in any circumstances. Little Club was completely susceptible to all the forms, and Einkorn moderately so to most of them. Some of the physiological forms isolated were of frequent occurrence and wide distribution, while others were rarely found. Forms 17 and 21 may be taken as representing the former class, and forms 5, 22, and 34 as typical of the latter.

Eight of the already known physiological forms of *P. graminis tritici* were chosen for a comparative morphological study. The differences in the size and shape of the uredospores of the various strains were sometimes as great as those in the size and shape of the uredospores of the composite forms of *P. graminis* [ibid., iii, p. 81]; that is, different physiological forms of *P. graminis tritici* are often quite as distinct from each other morphologically as the *tritici* variety is from the *avenae* or *secalis* varieties within the species *P. graminis.* There would, however, appear to be every justification for regarding the varieties *tritici*, *avenae*, and *secalis* (particularly the first-named) as of higher taxonomic rank than the physiological forms. A close agreement exists between the average of the means of the uredospore dimensions of the eight physiological forms of *P. graminis tritici* so far biometrically studied, and the means previously determined for the variety *tritici* as a whole; and further, a negative correlation obtains between the long and short diameters of the uredospores of all the forms within the *tritici* group, irrespective of cultural and environmental conditions.

A positive correlation was observed between the average temperature and total rainfall during the last two months of the growing season and the severity of stem rust infection on suscep-

tible varieties. When the total precipitation fell below 2 inches, or the temperature was under 60° F., no rust developed. Not more than 40 per cent. of infection (as estimated by the proportion of the leaf surface covered by rust pustules on the scale of the Office of Cereal Diseases, U.S. Dept. of Agric.) generally occurred at or below 62°, while over 90 per cent. was observed only where the average temperature ranged from 66° to 72° and the total rainfall exceed 2·5 inches.

Other factors besides temperature and rainfall were shown to have a preponderating influence on the development of rust epidemics, but the evaluation of these factors requires much further observation and experiment.

The relative parasitism of the various physiological forms was not found to be appreciably affected by external conditions nor by the locality of origin of the different isolations of each form. No evidence was obtained that the several forms arose by progressive adaptation to their environment.

CLARK (J. A.) & AUSEMUS (E. R.). **Immunity of Hope Wheat from black stem rust inherited as a dominant character.**—*Journ. Amer. Soc. Agron.*, xx, 2, pp. 152–159, 1 fig., 1928.

Hope, a selection from a cross of Marquis wheat on Yaroslav emmer, is a new hard red spring wheat which is stated to be the first wheat of this type that has so far proved practically immune from black stem rust [*Puccinia graminis*]. It is also immune from, or highly resistant to, leaf rust and bunt [*P. triticina* and *Tilletia levis*]. It has the characters of a common wheat and crosses with true common wheats more readily than do the emmers and with little or no sterility [*R.A.M.*, iv, p. 531]. The more important varieties of hard red spring wheat at present grown that may be classed as susceptible to stem rust rank in order of descending susceptibility under field conditions in the spring wheat States as follows: Red Bobs, Supreme, Preston, Haynes Bluestem, Power, Marquis, Reliance, and Ruby. Susceptibility in any of these may vary from 100 down to 20 per cent. infection; the corresponding figures in the susceptible durum varieties, namely, Kahla, Peliss, Arnautka, Mindum, Mondak, and Kubanka being 75 to 10 per cent. The varieties of hard red spring wheat that are classed as resistant to *P. graminis* (varying from 30 to 1 per cent. infection) may be ranked in descending order of average infection as follows: Progress, Ceres, Marquillo, Kota, and Webster. The resistant durum varieties (average infection 20 to 0 per cent.) are Nodak, Acme, Monad, and Pentad. The reaction of Hope is similar to that of the Khapli, Vernal, and Yaroslav varieties of emmer, which may carry a trace (1 to 2 per cent.) of rust under conditions of maximum infection.

The dominance of immunity from black stem rust in crosses with Hope as one of the parents under field conditions is stated to be remarkable. On a farm in Day County, South Dakota, the F_1 plants of a Hope-Supreme cross showed only a trace of rust in 1927, when Supreme was 100 per cent. infected and Hope entirely rust-free. In crosses between Hope on the one hand and Marquis and Reliance on the other, immunity was inherited as a dominant

character, with approximately half the hybrid plants rust-free in the F_2 generation. In a cross between Hope and the resistant Ceres variety, immunity was also inherited as a dominant character. In general, in the tests so far made, all F_1 plants in crosses having Hope as one parent were rust-free or had only a trace of infection. It was further found that strains homozygous for immunity may be obtained in the F_3 generation. While a similar rust reaction has been secured with certain physiological forms of stem rust under controlled greenhouse conditions, this is stated to be the first instance of its occurrence in the field.

The cultivation of Hope wheat and the evidence of the dominant inheritance of its immunity from stem rust in crosses with susceptible varieties is regarded as one of the most encouraging recent developments in wheat breeding.

TISDALE (W. H.) & TAPKE (V. F.). **Smuts of Wheat and Rye and their control.**—*U.S. Dept. of Agric. Farmers' Bull.* 1540, 16 pp., 8 figs., 1927.

This bulletin gives a brief, popular account of the chief smuts of wheat and rye that occur in the United States, namely *Tilletia tritici, T. levis, Ustilago tritici, Urocystis tritici,* and *U. occulta,* with particular reference to the methods now in practice for their control, all of which are well known. In a separate table a synopsis is given of the principal cereal smuts that are controlled by seed disinfection, together with directions for the application of seed treatment.

MOURASHKINSKY (K. E.). Влияние различных источников спор **Tilletia tritici** и **T. levis** на пораженность Пшеницы мокрой головней. [Effect of the source of origin of *Tilletia tritici* and *T. levis* spores on the susceptibility of Wheat to infection with bunt.]—*Труды Сибирск. Инст. С.-Хоз. и Лесоводства* [*Trans. Siberian Inst. of Agric. and Forestry*], ix, 4, pp. 3–10, 1928.

After a brief review of the existing literature on the question of the existence of physiological races or strains in the Ustilaginaceae, with particular reference to the work done by Rodenhiser and Stakman on the biological specialization of *Tilletia tritici* and *T. levis* [*R.A.M.*, vi, p. 604], the author gives an outline of experiments conducted since 1922 at the Siberian Institute of Agriculture and Forestry [Omsk] with a view to studying physiological immunity of wheat from bunt, and especially to investigate the effect of the source of origin of the spores on the susceptibility of different varieties of wheat to infection with *T. tritici* and *T. levis.* For this purpose pure strains of both fungi were maintained for two years by repeated passage of the parasites through the same hosts, the immediate effect of which was a slight increase of virulence in the organisms. In 1925 and 1926 cross-inoculations were made with the spores of both species, as well as with strains obtained from America, on different species of *Triticum,* including *T. vulgare* var. *lutescens* (Kitchener wheat of American origin but bred in Siberia for several generations). Although the results are not considered to be conclusive, there was no indication of any considerable variation in the susceptibility or resistance of the varieties tested accord-

ing to the source of origin of the spores, with the exception of the Kitchener wheat which proved to be particularly susceptible to strains of *T. tritici* and *T. levis* of American origin. The author is inclined to believe that these results do not support the view that there are fixed biological strains of both fungi, but only indicate the early stages of the differentiation of such strains or races.

PIEKENBROCK (P.). **Untersuchungen über das Verhalten des Ustilago tritici an Sorten und Kreuzungen.** [Investigations on the behaviour of *Ustilago tritici* towards varieties and hybrids.]—*Kühn-Arch.*, xv, pp. 411–456, 2 pl., 1 fig., 1927. [Abs. in *Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxviii, 3–4, p. 104, 1928.]

In order to determine whether loose smut of wheat (*Ustilago tritici*] includes physiological strains, the flowers of different varieties and hybrids were artificially inoculated with the spores of the fungus by means of a special apparatus [described and figured in the original]. The most successful results were obtained from the second to the fifth day of flowering. The Grüne Dame variety grown at the Halle Agricultural Institute proved completely resistant to *U. tritici* from the local experimental field, while it was susceptible to a collection of the smut from the same variety grown elsewhere. This is interpreted as pointing to the existence of various biotypes or physiological strains of *U. tritici* in Germany. Rümker's Dickkopf and Rimpau's red Schlanstedt summer wheats were both highly susceptible. In crosses between the abovementioned varieties immunity from loose smut was found to segregate in the F_2 and F_3 generations and to be inherited recessively, so that breeding for immunity may give useful results.

GAINES (E. F.). **New physiologic forms of Tilletia tritici in Wheat.**—Abs. in *Phytopath.*, xviii, 1, p. 139, 1928.

During 1927 bunt (*Tilletia tritici*) appeared on hitherto immune strains of wheat at five different stations in Washington, Oregon, and Montana. A test of the comparative pathogenicity of *T. tritici* from Germany with that common to eastern Washington revealed unmistakable differences. The American wheats were much more susceptible to the German form, and the German ones to the American strains. Inoculation tests in Europe show that the so-called immune American varieties are sometimes infected. The gradual increase of bunt in Kansas, Virginia, Pennsylvania, and other parts of America during recent years may be due to the development of new strains of the fungus which are more virulent on the wheats commonly grown there.

NOELDECHEN. **Dreijährige Trockenbeizversuche.** [Three years' dusting experiments.]—*Pflanzenbau*, iv, 13, pp. 198–202, 1928.

In three years' experiments [the results of which are described and tabulated] in the control of wheat bunt [*Tilletia tritici* and *T. levis*] by dusting, abavit B was the only preparation giving uniformly reliable results [*R.A.M.*, vii, p. 152]. Tillantin gave complete control of the disease in two out of four tests, but tillantin

R (formerly uspulun dust) and 225/V proved ineffective, while porzol is stated to be quite unsuitable for use under German conditions. Discussing these data and comparing them with those obtained by other workers, the writer concludes that dusting with standard preparations can safely be recommended to individual farmers wishing to guarantee a good yield; it would, however, be premature to advise its adoption on a wide scale by co-operative societies and the like, since the risks involved in such cases are too great.

FRIEDRICHS (G.). **Die Trockenbeizung des Getreides mittels Dauerbeizmaschinen.** [The dusting of seed-grain by means of continuous disinfection apparatus.]—*Fortschr. der Landw.*, iii, 2, pp. 58–66, 5 figs., 1928.

Details are given of the author's tests of four types of continuous disinfection apparatus for the dusting of seed-grain, of which the Petkus (Gebr. Röber, G.m.b.H., Wutha i Th.) proved the most effective. It is pointed out that, while 150 gm. of disinfectant per cwt. of seed-grain is sufficient for the control of wheat bunt [*Tilletia tritici* and *T. levis*] and snow mould of rye [*Calonectria graminicola*] with this machine, it is necessary to use 200 gm. to obtain comparable results against stripe disease of barley [*Helminthosporium gramineum*].

NIETHAMMER (ANNELIESE). **Sekundäre Beizwirkungen.** [Secondary effects of steeping.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxviii, 3–4, pp. 83–87, 1928.

The writer has observed various secondary effects in connexion with the disinfection of wheat seed-grain against fungous parasites. A slight but definite stimulus to germination was afforded by immersion in 0·1 per cent. uspulun or germisan, and by dusting with 0·1 per cent. tutan or abavit B. This effect was naturally most marked in seed of a somewhat inferior quality. Generally speaking, the germinative capacity of the seeds of weeds mixed with the grain is not affected by the disinfectants, but occasionally it may either be stimulated or reduced to a noticeable extent.

WOLF (A. C.). **Physikalisch-chemische Studien über den Einfluss oberflächenaktiver Stoffe auf Samenzellen (Weizen) und Sporen von Tilletia tritici.** [Physico-chemical studies on the influence of surface active substances on seed cells (Wheat) and spores of *Tilletia tritici*.]—*Biochem. Zeitschr.*, clxxxviii, 1–3, pp. 117–133, 10 graphs, 1927.

A series of experiments was instituted to ascertain the effect of the surface active ethyl alcohol, alone and in combination with corrosive sublimate and other mercurial preparations, on Hohenheimer Dickkopf wheat seed-grain, as well as on the spores of *Tilletia tritici*.

Ethyl alcohol alone destroyed the germinative capacity of the seed at a strength of 40 to 60 per cent., and the same concentration also killed the bunt spores. At higher concentrations, however, there was a resumption of germination of the seed, and after treatment in solutions of 80 and 96 per cent. the spores also germinated

profusely. This is considered to be due to precipitations in the surface layers which impede the penetration of the alcohol. In combinations of ethyl alcohol and corrosive sublimate at varying concentrations, the alcohol facilitates the penetration of the seed by the mercurial fungicide and thus accentuates its toxicity, germination being most severely injured at the same concentration as in the case of ethyl alcohol alone.

It was found that formaldehyde and segetan-neu are surface acting substances and cause more serious injury to treated seed-grain than the superficially inactive preparations, germisan, urania, uspulun, höchst [tillantin], and agfa.

Trelease (S. F.) & Trelease (Helen M.). **Susceptibility of Wheat to mildew as influenced by salt nutrition.**—*Bull. Torrey Bot. Club*, lv, 1, pp. 41–67, 2 pl., 4 graphs, 1928.

Details are given of a series of experiments made by the authors with a view to eliciting the effect of various mineral salt nutrient solutions on the susceptibility of plants to fungous diseases, wheat mildew (*Erysiphe graminis*) being chosen for the reason that it is a disease which is easy to study under greenhouse conditions. The experiments consisted in growing Marquis wheat in 29 different culture solutions giving a wide range of proportions of the three main salts, namely, KH_2PO_4, $Ca(NO_3)_2$, and $MgSO_4$, but all having the same total molecular concentration (0·02 gram-molecule per litre). When the first leaf of the wheat seedlings had expanded, the cultures were heavily inoculated with spores of *E. graminis*, and notes were taken on the subsequent development of the mildew on the seedlings. At the end of 31 days of growth the plants were removed and their dry weights were determined. The criteria employed for determining the relative susceptibility of the seedlings to the fungus were the difference in the dry weight yield between infected and uninfected seedlings, and the apparent development of mildew per unit area of leaf surface. The results indicated that the susceptibility of Marquis wheat to the disease may be influenced to a high degree by the composition of the culture solution supplied to the roots.

On the basis of dry weight yield, the least susceptible seedlings were those that were grown in a solution having the following molecular proportions of the main salts, namely, 90 per cent. KH_2PO_4, 5 per cent. $Ca(NO_3)_2$, and 5 per cent. $MgSO_4$ (the percentage figures in all cases representing percentages of 0·02 gram-molecule per litre), while the most susceptible were those supplied with a solution containing 5 per cent. KH_2PO_4, 47·5 per cent. $Ca(NO_3)_2$, and 47·5 per cent. $MgSO_4$. On the basis of the development of mildew on the leaves the plants grown in a solution with 96 per cent. KH_2PO_4, and 2 per cent. each of $Ca(NO_3)_2$ and $MgSO_4$ exhibited an even higher degree of resistance than those supplied with 90 per cent. of the first salt and 5 per cent. of each of the other two. On the same basis, it was noted that the plants grown in several other solutions with a very low partial concentration of $Ca(NO_3)_2$ also exhibited a low degree of susceptibility. It was also found that the proportions of the salts that allowed an optimum growth of the infected plants were different from the proportions that per-

mitted an optimum growth of the uninfected plants. No close correlation could be established, under the conditions of the experiments, between the vigour of the host and its susceptibility to mildew, thus indicating that some condition or conditions that may be independent of host vigour appear to determine the susceptibility of the plant. It is pointed out that the results of the investigations do not support the view that reduced vigour of the host is an index of its susceptibility to invasion by a parasite.

PORTER (R. H.). **Seed disinfectants for the control of covered smut and stripe of hulless Barley.**—Abs. in *Phytopath.*, xviii, 1, p. 139, 1928.

In 1925 the incidence of covered smut of hull-less barley [*Ustilago hordei*] at Nanking, China, was reduced from 7 to 0·5 per cent. in rod-row tests by tillantin B (0·3 per cent. solution), 0·3 per cent. uspulun, and cold and hot formaldehyde liquid treatments, and by tillantin B, uspulun [tillantin R], and powdered copper sulphate dusts. In rod-square plots the controls showed 27 per cent. smut and those treated with 54 per cent. copper carbonate, 1·2 per cent. In 1926 copper carbonate and tillantin R dust entirely eliminated smut, while tillantin B dust gave 0·87 per cent., compared with an average of 6 per cent. in the controls. The percentage increases in yield due to copper carbonate, tillantin R, and tillantin B were 15·4, 12·4, and 20·7 per cent., respectively, in 1926; the average yield of the controls was 13 bushels per acre. The incidence of stripe [*Helminthosporium gramineum*] was reduced from 10·8 to 5·5, 4, and 4 per cent., respectively, by copper carbonate, tillantin R, and tillantin B dusts, the corresponding increases of yield being 10, 9·6, and 10 bushels per acre; the average yield of the controls in this test was 45·3 bushels per acre.

MOLDENHAUER (J.). **Untersuchungen über die Empfänglichkeit der Wild- und Kulturhaferformen für Ustilago avenae mit besonderer Berücksichtigung des Infektionsvorganges.** [Investigations on the susceptibility to *Ustilago avenae* of wild and cultivated strains of Oats, with special reference to the process of infection.]—*Kühn-Arch.*, xv, pp. 349–409, 4 pl., 1927. [Abs. in *Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxviii, 3–4, pp. 104–105, 1928.]

The writer's inoculation experiments with loose smut of oats (*Ustilago avenae*), conducted by Zade's method of flower infection [*R.A.M.*, iii, p. 642], gave positive results with *Avena fatua* (56 per cent.), *A. abyssinica* (8 per cent.), and two strains of *A. sativa* (8 and 32 per cent.), but failed with five other species of *Avena*. The incidence of infection was observed to increase progressively with the depth of sowing. The sporidia, when remaining embedded between the caryopsis and glume, were found to retain their capacity for development for a full year. Positive results were given by inoculation experiments with sporidia from a pure culture. The juice of green oat plants was observed to stimulate spore germination, while this effect did not occur with that of seedling shoots without chlorophyll. The widely held opinion that rapidly-growing

varieties are immune from loose smut is only partially endorsed by the writer's experience. The spores of *U. avenae* germinated very quickly on a medium of 10 per cent. honey water. A promycelium with sporidia was formed on germination between 10° and 15° C. while at 25° only a long germ-tube developed.

STOREY (H. H.). **Transmission studies of Maize streak disease.** —*Ann. of Appl. Biol.*, xv, 1, pp. 1–25, 1 pl., 2 figs., 4 graphs, 1928.

This is a detailed account of the author's investigations of the transmission by the jassid *Balclutha mbila* of the streak disease of maize, some portions of which have already been noticed from other sources [*R.A.M.*, v, p. 188; vi, p. 377]. Experiments showed that eggs laid by infective individuals of *B. mbila* invariably produced uninfective progeny, but that at any moment of their development the young leafhoppers may become infective after feeding on a streak-diseased maize plant. It was also shown that adults may become infective after feeding on a diseased plant for one hour, but to a lesser degree than when the feeding period was prolonged for some days. Some individuals failed to acquire the infective power even when fed on diseased plants during the whole of their life, but their progeny did not exhibit the same refractoriness. There were no indications of cycles of alternating infective and uninfective periods in the insects, and their infective power did not appear to be influenced by preliminary starvation. With one exception, infectivity of the hoppers was retained throughout their life. The duration of the incubation period of the virus inside the insects was very variable but was shortest at high temperatures. Between 30° and 35° C. this period was usually between 12 and 48 hours. The absolute minimum observed was from 6 to 12 hours in an experiment at 30°. In the controlled temperature series, the maximal lengths of incubation were 57 to 63 hours at 30°, 60 to 84 hours at 25°, and over 84 hours at 16°. Comparative studies of infection by single hoppers and groups of hoppers showed that the groups caused infections more frequently and, on the average, in a lesser time of feeding; the incubation period of the disease on the host was, however, the same in both series, and it would therefore appear that the effect of a group of hoppers is the effect of the most virulent individual of the group, and not the sum of the effects of the members.

The passage of the virus down a leaf inoculated by the insects near its tip was neither prevented nor delayed by the cutting out of the main leaf vein lower down or the severance of the veins of half the lamina. By cutting off portions of the inoculated leaves below the point of feeding, it was shown that the downward movement of the virus occurs, at 30° C., at a rate exceeding 40 cm. in two hours. It was also found that a small proportion of uninfective hoppers which fed on the lower portion of a leaf inoculated higher up became infective, particularly when the inoculation was made with a large number of infective insects. Usually the virus was obtained by the leafhopper after feeding on the chlorotic areas, but not from the green areas, except in the few cases in which it appeared that the insect intercepted the virus during the passage

of the latter down the inoculated leaf. There was no consistent evidence that the virus passed from the inoculated leaf through the stem into the other fully formed leaves, but only to the new leaves being produced at the growing point.

MAINS (E. B.). **Inheritance of resistance to Puccinia sorghi in Maize.**—Abs. in *Phytopath.*, xviii, 1, p. 138, 1928.

Selections of Golden Glow 228, Golden Bantam 996, and Howling Mob 983 maize are resistant to physiological form 1 of *Puccinia sorghi* [*P. maydis*] and susceptible to form 3 in the seedling stage, while selections of Golden Glow 208 are resistant to both forms [*R.A.M.*, v, p. 486]. The inheritance of the resistance of the selections has been studied in a number of crosses with varieties susceptible to both these physiological forms of the rust. The ratios obtained in the F_2 generation closely approximate, for the most part, to 3 resistant : 1 susceptible, indicating a single factor pair in each case. A study of the inheritance of resistance in relation to endosperm colour and texture, albinism, and anther ear dwarf has, so far, given no evidence of linkage with these characters. The same factor is apparently responsible for the resistance of selections of Golden Glow 208 to both the forms of *P. maydis* tested.

PLATZ (G. A.). **The relation of oxygen to the germination of the chlamydospores of Ustilago zeae (Beck.) Unger.**—*Iowa State Coll. Journ. of Science*, ii, 2, pp. 137–143, 1 fig., 1928.

Experiments [which are described, and the results of which are tabulated] conducted to determine the relation of oxygen to spore germination of *Ustilago zeae* [*R.A.M.*, iii, p. 128] showed that spores dusted on the surfaces of culture media did not germinate when placed in chambers from which the air was exhausted by means of a vacuum pump or withdrawn by an alkaline solution of pyrogallic acid. Atmospheres containing less than three per cent. of oxygen did not favour germination, which, however, became comparable to that in the open air (83·2 and 75 per cent. as compared with 86·1 and 81·2 per cent. in the controls, in gelatine and tomato juice media, respectively) when the atmosphere contained five per cent. of oxygen.

Spores completely immersed in water, tomato juice, or gelatine, and kept in air-tight vials did not germinate.

Dusted upon the surface of water and dilute solutions of liquid media, the spores sank most deeply in the more diluted solutions, and did not germinate so well as in more concentrated solutions (up to 30 per cent. of tomato juice). The weakened germination in dilute solutions is attributed to a deficiency of atmospheric oxygen reaching the sunken spores.

MELHUS (I. E.), REDDY (C. S.), RALEIGH (W. P.), & BURNETT (L. C.). **Seed treatment for Corn diseases.**—*Iowa Agric. Exper Stat. Circ.* 108, 16 pp., 10 figs., 1 diag., 1928.

Investigations during the last twelve years showed that the most injurious seed diseases of maize in Iowa are the dry rots caused, respectively, by *Diplodia zeae*, *Basisporium gallarum*

[*Nigrospora sphaerica*], and *Gibberella saubinetii* [see above, p. 428]. The annual loss from these diseases in 1921 to 1927 is estimated at 4 to 10 per cent. of the total crop, with an average loss of 5 bushels per acre.

The common liquid fungicides were found ineffectual and injurious to the seed, but seed treatment [details of which are given] at the rate of 2 oz. per bushel with Bayer, semesan jr., or merko dusts (the active ingredient in all of which is mercury) gave an average increase in yield of 2½ to 5 bushels per acre. The cost of the disinfection was only 3 to 4 cents per acre.

YATZYNINA (CLAUDINE N.). О сухом протравливании Проса. [Dry disinfection of Millet seed.]—*La Défense des Plantes*, Leningrad, iv, 1, pp. 154–158, 1927. [Received May, 1928.]

A short series of experiments made in 1924 at the Moscow Plant Protection Station indicated that millet [*Panicum miliaceum*] loose smut (*Ustilago panici-miliacei*) is to a considerable degree amenable to control by dusting the seed-grain with anhydrous copper sulphate or copper carbonate at the rate of 24 zolotniks [1 zolotnik = 4·266 gm.] per pood [36 lb.] of grain, and that this method was little less efficacious than steeping the seed for 1 minute in a 0·15 per cent. formaldehyde solution or for 1 hour in a 0·25 per cent. uspulun solution. It was noted, however, that seed dusted immediately before sowing gave rise to a considerably smaller percentage of smutted plants than when the seed was dusted in advance and stored for any length of time. Dusting with either of the fungicides was less injurious to germination than treatment with formalin, but anhydrous copper sulphate had a delaying effect on the development of the seedlings as compared with copper carbonate.

OGILVIE (L.). **Notes on the growing of Citrus in Bermuda.**—*Agric. Bull. Bermuda Dept. of Agric.*, vi, 11, pp. 3–5; 12, pp. 4–5, 1927; vii, 2, pp. 3–6; 3, pp. 4–6, 1928.

Brief, popular notes are included in this paper on the following diseases of citrus. Gummosis (apparently identical with psorosis or scaly bark) [*R.A.M.*, v, p. 297], which is stated to be one of the chief causes of the decline of the Bermuda citrus (especially grapefruit) industry: a characteristic feature of the disease is the appearance of irregular scales of bark which appear to be pushed out from below and which usually exude gum, on the trunk and larger limbs; wither-tip (*Colletotrichum gloeosporioides*), occurring chiefly on lime and lemon trees weakened through various causes [ibid., vii, pp. 162, 163]; scab (*Sporotrichum citri*) [ibid., vii, p. 316]; black melanose [or greasy spot: ibid., vi, p. 148]; and 'frenching', supposed to be due to defective soil conditions and characterized by pale blotches between the veins on either side of the mid-rib and by the stiffness and pointed shape of the leaves. Attention is drawn to the risk of the introduction into Bermuda of citrus canker (*Pseudomonas citri*) and other diseases not hitherto recorded in the Colony.

POWELL (H. C.). **The Citrus industry in Palestine.**—*Palestine Dept. of Agric. & Forests, Agric. Leaflets* IV, Ser. 9, 35 pp., 5 figs., [1928].

This paper contains the following references of phytopathological interest. The trouble known by the general term of gummosis is by far the most serious disease in the citrus groves of Palestine. The author believes that the two forms of the disease caused respectively by *Pythiacystis* [*Phytophthora*] *citrophthora* and *Phytophthora parasitica* [*R.A.M.*, ii, pp. 540, 542] are present. The sweet lime (*Citrus aurantifolia* or *C. limetta*), which is extensively used as a root stock, is highly susceptible to this disease and should be replaced by sour orange (*C. bigaradia* or *C. aurantium*). Directions are given for the control of gummosis by suitable methods of planting and grafting (with special reference to inarching), supplemented by the excision of the diseased tissues and the application of a disinfectant, such as Bordeaux mixture.

Owing largely to careless handling during picking and packing operations, the average incidence of decay in transit is 10 to 25 per cent., the chief agents of infection being green mould (*Penicillium digitatum*) and blue contact mould (*P. italicum*) [ibid., vii, pp. 163, 238]. Suggestions are made for improvements in this direction.

NARASIMHAN (M. J.). **A new spray mixture against Areca koleroga.**—*Mysore Agric. Calendar*, pp. 24–25, 1928.

Effective control of the koleroga disease of areca palms [*Phytophthora arecae*] has been obtained during the last three years in Mysore by the application of a mixture prepared as follows: 2 lb. of potash alum is added to 2 lb. copper sulphate dissolved in 12 galls. water, and the resultant compound mixed with $2\frac{1}{2}$ lb. lime dissolved in 12 galls. water. A casein adhesive ($\frac{1}{2}$ lb. casein in $\frac{1}{2}$ gall. water plus $\frac{1}{2}$ lb. lime in $\frac{1}{2}$ gall. water) is added to the mixture. The cost of this preparation [known as Martini's Bordeaux solution: *R.A.M.*, vi, p. 78] compares very favourably with that of the resin-soda Bordeaux and casein-Bordeaux mixtures, the price of the chemicals required for spraying one acre (500 trees) being only Rs. 2·1 [about 3*s.*] compared with Rs. 4·4 [6*s.* 5*d.*] and Rs. 3·10 [5*s.* 5*d.*], respectively.

STOKOE (W. N.). **The rancidity of Coconut oil produced by mould action.**—*Biochem. Journ.*, xxii, 1, pp. 80–93, 1928.

The results of an experiment conducted at the Craigmillar (Midlothian) Creamery Company's Laboratory showed that the rancidity of coco-nut oil, caused by *Penicillium palitans*, is essentially due to the presence of methylamyl, methylheptyl, and methylnonyl ketones. The first-named substance occurs in the greatest quantity and is responsible for the characteristic 'perfume' odour of the rancid oil. There are further secondary alcohols and ethyl alcohol, with their esters, caprylic acid, and free fatty acids. The absorption of poisonous fatty acids by the mycelium impedes its respiration, and the resulting abnormal condition leads to the decomposition of the keto-acid to methyl ketone and carbon dioxide. The poisoning capacity of the fatty acids towards *P. palitans* increases with the molecular weight up to caprylic acid and then decreases.

Only acids up to lauric acid are absorbed, so that ketones of higher molecular weight than methylnonyl ketone are not formed. The fatty acids, except butyric acid, are more toxic to *Oidium* [*Oospora*] *lactis* than to *Penicillium*.

FINDLAY (W. P. K.). **Some conditions influencing the development of bacterial disease of Cotton (Bacterium malvacearum).**—*Empire Cotton Growing Review*, v, 1, pp. 29–39, 1 diag., 1928.

Preliminary inoculation experiments conducted during 1927 in Trinidad into the disease of cotton caused by *Bacterium malvacearum* [*R.A.M.*, vii, pp. 95, 317] showed that the Egyptian Sakel and the Sea Island varieties were very susceptible to the angular leaf spot form of the disease (throughout the experiments black arm seldom developed unless the stems were punctured), Trinidad Red Kidney was less so, while the Upland varieties were highly, and the Asiatics (Million Dollar and *Gossypium cernuum*) completely, resistant. In pot experiments Pima was more susceptible than Sea Island, especially as regards stem lesions. Inoculations of the flowers of Sea Island and Egyptian cotton were followed by large bacterial lesions on the young bolls, which soon became infected with secondary parasites, especially with a dark species of *Aspergillus* (? *A. niger*) [ibid., v, p. 425]. No good cotton was obtained from bolls inoculated early or through the flower, and most of the seeds from them were rotten and non-viable. On plants that had already set many bolls, infection of the flower was usually followed by shedding of the young boll.

About 50 per cent. of the seeds from bolls inoculated early or when in flower failed to germinate, while out of 51 seedlings examined when the third leaf was developing only two showed definite bacterial lesions. This result is attributed to the fact that very few viable seeds were obtained from any boll inoculated while in flower.

Seeds of Sea Island cotton were sterilized in sulphuric acid, washed, and sown in pots of soil which had borne diseased plants, and in which infected leaves were buried. In two pots the seeds were also watered with a strong suspension of *Bact. malvacearum*. Although the plants were grown on for several weeks after reaching the soil surface, no bacterial disease was seen. The author considers that external infection of the seed is of no importance and states that transmission through infected soil was never observed.

Two plants of Sakellarides cotton were selected and the stem of one was almost completely ringed down to the wood a few inches above ground level. Both were then sprayed with a suspension of the bacteria. One month later, the ringed plant showed one leaf and one boll attacked, with one doubtful stem lesion, while the unringed plant had 15 leaves and 3 bracts attacked. Another experiment gave 9 leaves and 2 bracts affected in the ringed plant, and 18 leaves and 7 bracts affected (some of the former very severely) in the unringed plant. In greenhouse experiments with Sea Island cotton, three ringed plants showed 1, 1, and 2, and the unringed plants 3, 4, and 3 diseased leaves, respectively, the latter also showing

more severe infection. These results and other observations are considered to support the view that plants in the carbohydrate (fruiting) phase are less susceptible than those in the actively metabolizing nitrogenous phase.

Experiments to test the effect of increased atmospheric humidity on the progress of the disease gave negative results.

Two plants of freshly ginned Sea Island cotton in each of five pots were waterlogged on 16th May to different levels, which were maintained daily, while two similar pots were watered normally. The plants in one of the two normally watered controls and all the waterlogged pots were sprayed uniformly with a suspension of the bacteria and every node and internode of one plant in each pot was then pricked with a sterile needle. Spots appeared, with definite lesions round most of the pricks on the inoculated plants in 13 days, the unsprayed control remaining healthy. A fortnight later, on the normally watered but sprayed control the lesions consisted of small, well defined, black areas restricted to a radius of a few millimetres from the punctures, while on the plants in saturated or completely waterlogged soil the lesions (especially those near the apex) extended some distance along the stem and were still spreading. Spread was greatest in the almost or completely waterlogged pots, suggesting that the resistance of the plants was reduced by asphyxiation of the roots. The unsprayed control showed no spots, while each plant in the completely waterlogged pot showed 4 or 5 leaves badly spotted, especially along the vascular bundles.

The addition of ammonium sulphate to the soil appeared definitely to increase susceptibility.

From a general review of these results the author concludes that the vegetative, nitrogenous, immature plant is most susceptible, and that any operation which expedites maturity will probably reduce infection.

HEWISON (H. K.) & SYMOND (J. E.). **Observations on a fungus disease and an insect pest of Cotton.**—*Empire Cotton Growing Review*, v, 1, pp. 48–53, 1928.

Experiments conducted in Trinidad during 1926–7, in plots sown with Sea Island, Red Kidney, Ishan, Cawnpore, and Sakel cotton showed that the plants in certain areas, to which heavily manured soil had been added for levelling, made abnormal and prolonged vegetative growth, whereas the growth in the rest of the plots was poor owing to defective soil conditions. Heavy rain from November to February promoted the growth of the plants in the manured soil, but checked it in the rest.

During February most of the plots showed an increase in the amount of leaf spot (*Alternaria longipedicellata*) [*A. macrospora* Zimm.], but in others the infection was arrested or even diminished, the incidence of the disease being directly correlated with lack of vigour of the host.

These results are attributed to the asphyxiation of the roots of young plants through poor soil and continued rain, while with the more favourably situated plants the rains facilitated root penetration to layers richer in food. It was also noted that many plants growing vigorously and in a condition compatible with a

low carbohydrate-nitrogen ratio were markedly susceptible to leaf spot.

The prevalence and severity of the disease diminished as the weather grew drier, except in plots where the plants showed signs of senescence. The Cawnpore variety was the least susceptible.

PECCHIONI (E.). **La lotta contro il calcino del baco da seta e le disposizioni del regolamento emanato dall' Ente Serico.** [The control of muscardine of the silkworm and the arrangements made by regulation of the Sericultural Society.]—*Il Coltivatore*, lxxiv, 1, pp. 8–11, 1928.

Referring to recent legislation against the muscardine disease [*Beauveria bassiana*] of silkworms in Italy [*R.A.M.*, vi, p. 726], the author points out that prompt preventive measures are the most urgent need, and suggests that the mayor of each commune should at once prepare a list of all the local silkworm rearers, and request them to have their premises and appliances overhauled, cleaned, and, where necessary, repaired; the broom bundles in which the cocoons were formed in the previous year should be burnt unless otherwise ordered by an inspector. Inspections should be made to see that these precautions are duly taken. Disinfection squads should be formed, and in the latter half of April and throughout May a vigorous disinfection campaign should be carried out with formalin, sulphur, or chlorine. Attempts to conceal the presence of the disease should be punished by a fine.

RÉGNIER (R.). **Les taupins nuisibles en grande culture. Contribution à l'étude de l'Agriotes obscurus L.** [Wireworms injurious to farm crops. Contribution to the study of *Agriotes obscurus* L.]—*Rev. Path. Vég. et Ent. Agric.*, xv, 2, pp. 40–47, 2 pl., 1928.

The author states that in his breeding experiments with larvae of the wireworm *Agriotes obscurus*, on several occasions he found these larvae killed by a fungus belonging to the genus *Isaria*, and also by an undetermined mould. No morphological or other details of these organisms are given.

DE CASTRO (A. M.). **Epidermophyton rubrum, Cast. Contribuição para o seu estudo clinico, experimental e parasitologico.** [*Epidermophyton rubrum* Cast. Contribution to its clinical, experimental, and parasitological study.]—*Ann. Fac. Med. São Paulo*, ii, pp. 441–477, 21 pl. (1 col.), 1927. [French and German summaries. Received May, 1928.]

Out of 180 cases of dermatomycosis examined during 1925 and 1926, six were found to be due to *Epidermophyton rubrum* [*R.A.M.*, vi, p. 483]. In each case the patient had contracted the disease in São Paulo, from which it is concluded that the fungus is of fairly frequent occurrence in Brazil. The chief sites of infection were the folds of the skin, the nails being attacked only in one instance. Neither in the author's patients nor in guinea-pigs inoculated with the fungus was the hair infected.

Marked characteristics of *E. rubrum* are its extremely minute

dimensions and the intense crimson coloration produced in sugar-containing media. The chief mycological characters of the organism in hanging drops are the sporiferous thyrses and fusiform chlamydospores.

The lesions produced in man by *E. rubrum* are of a chronic nature and may extend over considerable areas in various parts of the body. They are usually circinate and arciform, of the eczema marginatum Hebra type, and are readily amenable to suitable treatment.

ROTHERS (B. V.). **Заметка о двух новых паразитных грибках на Льне.** [A note on two new fungi parasitic on Flax.]—*La Défense des Plantes*, Leningrad, iv, 3, p. 535, 1927. [Received May, 1928.]

Brief descriptions and Latin diagnoses are given of two new fungi which were found parasitizing flax in samples collected in the autumn of 1926 in the North Dvina government [north-west Russia], namely, *Ascochyta usitatissima* and *Mycosphaerella linicola* var. *latispora*. The first-named species forms on the apical portion of flax stems gregarious, fuscous, globose or elliptical, submerged pycnidia, 100 to 150 μ in diameter; the stylospores are bicellular, slightly constricted at the septum, hyaline, and 15 to 23 by 6 to 8 μ in diameter. The second only differs from Naoumoff's type species [*R.A.M.*, v, p. 611] in the larger size of its spores, which are 19 to 23 by 6 to 7 μ in diameter as against 16·8 by 3·4 μ in Naoumoff's description.

Besides the above-named fungi, the samples were also infected with *A. linicola* [loc. cit.] and *Colletotrichum lini*.

WATERMAN (ALMA M.). **Rose diseases: their causes and control.** —*U.S. Dept. of Agric. Farmers' Bull.* 1547, 19 pp., 10 figs., 1928.

In this bulletin brief, popular descriptions are given of the most common fungous and bacterial diseases of roses which occur in the United States, namely: powdery mildew (*Sphaerotheca* [*pannosa*]), black leaf spot (*Diplocarpon rosae*), rust (*Phragmidium* spp.), various leaf spots (species of *Cercospora*, *Phyllosticta*, *Septoria*, and other fungi), stem canker (*Coniothyrium fuckelii*) [*Leptosphaeria coniothyrium*], brand canker (*C. wernsdorffiae*), graft canker (*C. rosarum*), brown canker (*Diaporthe umbrina*), crown canker (*Cylindrocladium scoparium*), cane blight (*Botryosphaeria ribis chromogena*), blossom blight (*Botrytis* spp.), and crown gall (*Bacterium tumefaciens*). In each case the methods of control best adapted for general use are also given.

KUNKEL (L. O.). **Further studies on the host range of Aster yellows.**—Abs. in *Phytopath.*, xviii, 1, p. 156, 1928.

During the past year the known host range of aster yellows [*R.A.M.*, vii, p. 378] has been extended by the experimental transmission of the disease to 21 species in 13 different families, mostly cultivated flowering plants. Transmission was uniformly accomplished by means of the leafhopper *Cicadula sexnotata*. Infection was carried to plants in five families not previously reported to

contain susceptible species, and the total number of species now known to be affected is over 70, belonging to 28 different families. However, many species closely related to susceptible ones are immune. For instance, *Plantago lanceolata*, a favourite host of the aster leafhopper and closely related to the susceptible *P. major*, does not contract infection, and the same is true of *Centaurea cyanus*, which is nearly allied to the highly susceptible *C. imperialis*. Aster yellows has been shown by transmission tests to be distinct from witches' broom of potatoes [ibid., vi, p. 746] and from a similar disease of *Eupatorium perfoliatum* widely distributed in the Middle West of the United States.

JONES (L. R.) & RIKER (REGINA S.). **Studies upon the Fusarium wilt of China Aster.**—Abs. in *Phytopath.*, xviii, 1, p. 150, 1928.

The causal organism of China aster wilt (*Fusarium conglutinans* var. *callistephi*) is stated to be scarcely distinguishable from that of cabbage yellows, but reciprocal crosses showed each to be specific [*R.A.M.*, vi, p. 556]. The temperature relations of both organisms were also very similar. No external symptoms of the disease appeared at 12° C., but infection developed at 16° and increased rapidly with rising temperatures up to 32°. Considerable differences in varietal reaction to wilt have been observed in commercial aster plantations, and encouraging progress has been made during the past three seasons in the selection of resistant strains, including different colours of Giant Branching and Heart of France.

BLUMER (S.). **Über den Mehltau der Hortensie.** [On Hydrangea mildew.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxviii, 3–4, pp. 78–83, 3 figs., 1928.

Considerable damage has been caused in Switzerland of recent years by hydrangea mildew (*Oidium hortensiae*) [*R.A.M.*, vii, p. 245], to which the dark-flowered varieties, e.g., Helge, Marchal Foch, Gudrun, and Eclaireur appear to be particularly susceptible, while Niedersachsen and La Marne are reported to be immune. Successful inoculation experiments on these last-named varieties showed, however, that they enjoy no genetic immunity from mildew but merely possess a high degree of resistance, which is not proof against infection under conditions favourable to the fungus. Positive results were further obtained, in Petri dish experiments only, on *Hydrangea arborescens* and *H. radiata*, not previously recorded as hosts of *Oidium*.

The conidia of the fungus measure 32 to 40 by 17 to 19 μ (average 36·2 by 18·1 μ); the development of the germ-tubes and appressoria resembles that of *Erysiphe polygoni*, to which species the writer is inclined to refer the fungus [cf. ibid., vi, p. 512].

ELMER (O. H.). **Penicillium corm rot of Gladioli.**—Abs. in *Phytopath.*, xviii, 1, p. 151, 1928.

A hitherto undescribed storage rot of gladiolus corms has frequently been observed in Iowa during the past two years. Infected corms develop dry brown lesions with a dark grey interior, the

diseased area extending to the heart and finally involving the entire corm. The fungus produces numerous sclerotia and abundant masses of blue conidia, the latter developing especially under humid conditions. The causal organism was found to be a new species of *Penicillium*, *P. gladioli* (to be described elsewhere) [see next abstract]. Conidial development is sparse on potato dextrose agar but sclerotia are produced in large numbers on this medium. Infection of stored corms was effected only through wounds. This disease has recently been the most common storage rot of gladiolus corms in Iowa, and also occurred in consignments from Minnesota and Indiana.

McCulloch (Lucia) & Thom (C.). **A rot of Gladiolus corms caused by Penicillium gladioli, L. McC. and Thom.**—*Journ. Agric. Res.*, xxxvi, 3, pp. 217–224, 1 pl., 1928.

A rot of gladiolus corms and *Tigridia* bulbs due to a species of *Penicillium* [a technical diagnosis of which is given] has been under observation since May, 1926 [see preceding abstract]. Both growing and stored corms become infected even through slight wounds, but no infection has been secured on uninjured material. The dark brown rot invades the tissues fairly rapidly at temperatures from 15° to 23° C. Smooth, irregularly spherical, cream-coloured to light brown sclerotia, 140 to 150 μ in diameter, appear in large numbers both on the surface and in the interior of the attacked corms. On most culture media a small area of dull bluish-green, elliptical to fusiform, smooth conidia, 2·8 to 3·6 by 2·5 to 3 μ, surrounded by scanty white hyphae and numerous sclerotia, is produced at room temperature. The conidiophores are up to 2 mm. long, sometimes branched, and with few sterigmata which measure 12 to 14 by 1·5 to 2 μ. Above 20° conidial development is very sparse, while at lower temperatures it is profuse and coremia develop. The pathogenicity of the fungus, which is named *P. gladioli* n.sp., has been proved by inoculation experiments and the connexion between the sclerotial and conidial stages definitely established. The organism has been found in corms from Holland, New Mexico, Canada, Kansas, and New York. Experiments with mercuric chloride and commercial preparations show that the sclerotia are rather resistant to fungicides.

[A condensed version of this paper also appeared in *Science*, N.S., lxvii, 1730, pp. 216–217, 1928.]

Monteith (J.). **Clover anthracnose caused by Colletotrichum trifolii.**—*U.S. Dept. of Agric. Tech. Bull.* 28, 26 pp., 7 pl., 1 fig., 3 graphs, 1928.

This bulletin gives a detailed account of clover anthracnose caused by *Colletotrichum trifolii*, but a considerable part of the information contained in it has already been noticed from earlier papers [*R.A.M.*, v, p. 431; vi, p. 234]. The fungus is stated to have been first recorded in Tennessee in 1905, since when it has been found to occur in practically all the States of the eastern and mid-western clover belt, as well as in southern Canada. In 1922 it was also reported from South Africa [ibid., ii, p. 110], but it is not known elsewhere. Besides on red clover (*Trifolium pratense*), *C.*

trifolii is common on lucerne (*Medicago sativa*) within its area of dispersion on the former; it has also been recorded on crimson and subterranean clovers (*T. incarnatum* and *T. subterraneum*), bur clover (*Medicago hirsuta*), and sweet clover (*Melilotus alba*), and inoculation experiments in the greenhouse have shown that these species are readily infected by it, thus indicating that the organism has a much wider range of hosts than is usually assumed. The inclusion of lucerne and sweet clover in the host range of *C. trifolii* constitutes an important distinction between this fungus and *Gloeosporium caulivorum*, since the latter has not been so far reported on these plants, except where based on Saccardo's obvious error in listing *M. sativa* as the host instead of *T. pratense* which was given in Kirchner's original description.

Experiments showed that *C. trifolii* retains its viability for long periods in dried clover tissues, and all the evidence collected indicates that it overwinters in the field as conidia or mycelium in living or dead host tissue. It is believed that dissemination of the fungus occurs by wind-blown dried infected leaves or stems, while locally the spores are distributed by spattering rain drops and possibly also by insects or other animals. Infection of leaves and stems usually takes place directly through the uninjured epidermis, while crown or root infection is frequently greatly aided by insect injuries. Under favourable conditions of temperature and moisture the period of incubation is from three to five days. Infection experiments conducted at constant air temperatures showed that temperature is an important factor in infection and in the later development of the disease, the optimum being approximately the same as that for growth on potato-dextrose agar, namely, about 28° C. This temperature relationship largely accounts for the geographical distribution and the seasonal development of anthracnose.

The measures of control usually recommended, such as spraying or dusting, crop rotation, seed disinfection, autumn sowing, &c., are considered as only of limited application, while control by the use of resistant varieties offers the best promise of success. The Tennessee anthracnose-resistant strain of red clover still shows decided resistance, although no recent selections have been made. It was also noticed that clover seed from stocks grown in regions where the disease is regularly severe is, as a rule, much more resistant than imported strains, this being chiefly attributed to the common practices in clover culture and to natural selection.

TROUSSOVA (Mme N.). К вопросу о возможности нахождения склероциев **Sclerotinia trifoliorum Eriks.** в семенах Клевера. [On the possibility of the admixture of sclerotia of *Sclerotinia trifoliorum* Eriks. in Clover seed.]—*La Défense des Plantes*, Leningrad, iv, 1, pp. 179–180, 2 figs., 1927. [Received May, 1928.]

In drawing attention to V. Sviderski's paper (*Roczniki Nauk Rolniczych* [*Yearbook of Agricultural Sciences*], Lemberg, xi, 2, 1924), in which it is stated that sclerotia of *Sclerotinia trifoliorum* are frequently to be found mixed with seed of red clover [*Trifolium pratense*] originating from Podolia [south-west Russia], the

present author controverts this statement on the ground that it is quite impossible for these sclerotia to be gathered with the seed, since they are exclusively formed in the spring on plants that are killed before maturing their seed. Sclerotia are indeed occasionally to be found in red clover seed, but on investigation they always proved to be those of the fungus *Typhula trifolii*, which are formed on the stems and leaves of dying plants. This fungus is not known to cause appreciable injury to red clover. Macroscopically the sclerotia of *T. trifolii* are easily to be distinguished from those of *S. trifoliorum*, as they are round, of a dark brown to black colour, with a reticulate surface, and from 1 to 1·5 mm. in diameter, while those of *S. trifoliorum* are of an irregular shape, with a smooth, black surface, and attain the size of a pea.

DAVIS (W. H.). **Two physiological forms of Ustilago striaeformis (Westd.) Niessl.**—Abs. in *Phytopath.*, xviii, 1, p. 149, 1928.

Ustilago striaeformis collected on timothy (*Phleum pratense*) and redtop (*Agrostis palustris*) was used for 15 series of field and greenhouse, reciprocal and multiple, inoculations to ascertain whether physiological forms of this smut occur in these two hosts. Inoculum taken from timothy infected timothy only, while that from redtop infected only redtop. There are thus two physiological forms of *U. striaeformis* on these hosts, for which the form names *phlei-pratensis* and *agrostis-palustris* are suggested.

Sprøjtning af Frugttraeer. [Spraying of fruit trees.]—*Statens Forsøgsvirksomhed i Plantekultur Meddel.* 122, 4 pp., 2 figs., 1928.

This is a condensed version of the official Danish spray calendar for the control of fungous diseases and insect pests of fruit trees, an extended account of which has already been noticed [*R.A.M.*, v, p. 559].

MAGILL (W. W.) & OLNEY (A. J.). **Spraying fruit in Kentucky.**—*Kentucky Coll. of Agric. Circ.* 176 (revised), 15 pp., 8 figs., 1928.

Spray schedules (with notes) are given for the control of different fungous diseases and insect pests of apples, peaches, pears, plums, sour cherries, and grapes in Kentucky.

Apple and Pear scab.—*Min. of Agric. Leaflet* 131, 11 pp., 2 pl., revised January, 1928.

This is a brief and popular account of apple and pear scab (*Venturia inaequalis* and *V. pirina*) and of the damage caused by them in Great Britain. A large portion of the leaflet is devoted to preventive and control measures, and a few notes are given on the relative resistance to the fungi of some varieties of apples and pears.

KÖCK (G.). **Beiträge zum Problem der Schorfkrankheiten unseres Kernobstes mit besonderer Berücksichtigung der Widerstandsfähigkeit einzelner Sorten.** [Contributions to the problem of the diseases of our core fruit with special refer-

ence to the resistance of individual varieties.]—*Die Landwirtschaft*, pp. 264–266, 307–309, 346–347, 1927. [Abs. in *Bot. Centralbl.*, N.F., xii, 3–4, p. 119, 1928.]

The data elicited in response to a questionnaire circulated among Austrian fruit-growers in 1926 show that apple scab [*Venturia inaequalis*] was more prevalent than pear scab [*V. pirina*], and that the influence of soil conditions on the occurrence of infection was negligible. The degree of susceptibility of individual varieties was accurately gauged by means of the classification index [*R.A.M.*, vii, p. 177]. In 46 per cent. of the cases no control measures were applied, while copper preparations were used in 37, dendrin in 15, and solbar in 2.

WILSON (E. E.). **Factors important in the development of perithecia of Venturia inaequalis.**—Abs. in *Phytopath.*, xviii, 1 pp. 145–146, 1928.

Further studies in connexion with perithecial development in *Venturia inaequalis* confirmed previous data on the correlation between the time of leaf fall and the date of maturity of the ascospores in the following spring [cf. *R.A.M.*, vii, p. 140]. In both the last two years ascospores matured earlier in leaves placed on the ground in September than in those similarly placed later in the autumn. A delay in leaf fall, however, was followed by some curtailment of the interval between this process and the maturation of the ascospores.

Temperature and moisture are cardinal factors in perithecial development. The optimum temperature for the initiation of the perithecia was found to be near 13° C., while that for the maturation of the ascopores was close to 20°. Growth of asci was found to occur more readily than maturation of ascospores at 4° to 7°. Perithecial development was sharply arrested when the moisture of the leaf fell below an undefined limit. Alternate wetting and drying of the leaves stimulated the maturation of the perithecia. The type and abundance of leaf lesions appeared to bear a direct relationship to the quantity of perithecia produced. No evidence was found that perithecia were formed at points remote from lesions or that the fungus spreads to uninfected leaves after falling.

BALLOU (F. H.) & LEWIS (I. P.). **Spraying for prevention of Apple blotch and Apple scab.**—*Ohio Agric. Exper. Stat. Bull.* 413, 32 pp., 1 pl., 11 figs., 1927. [Received April, 1928.]

This is a full report of the results obtained by the authors in their experiments in the prevention of apple blotch (*Phyllosticta solitaria*) and apple scab (*Venturia inaequalis*) which were concluded in 1926, and some details of which have already been noticed from other sources [*R.A.M.*, vi, p. 561].

An important point established by these experiments is stated to be that lime-sulphur was shown to be of equal value, and in some respects even superior, to the Bordeaux mixtures tested. There was also evidence that commercial dry or powdered lime-sulphur, as now produced, not only equals the commercial liquid form, but possesses the additional advantage of being less likely to injure the

foliage and fruit when applied as a spray in hot weather at the rate of 3 lb. to 50 galls. of water. In addition to their efficacy in blotch and scab prevention, the lime-sulphur sprays gave fruit of a superior colour and finish as compared with that from the plots treated with Bordeaux mixture sprays. They also proved very effective, when used throughout the season, in assisting to control the San José scale.

The experiments also showed that Bordeaux mixtures in which the proportion of copper sulphate was reduced to a minimum (the weakest formula used being 0·75–2·25–50 for blotch and 0·5–2·5–50 for scab) were as effective in controlling the diseases as the 3–9–60 mixture, while in colour and finish the apples sprayed with the more dilute mixtures were greatly superior to those sprayed with the stronger mixtures which russeted and roughened the skin of the apples.

There were indications that in some seasons the best quality of freshly hydrated lime may give a high degree of control both of apple blotch and scab when used alone at the concentration of 9lb. to 50 galls. water, or in combination with arsenate of lead [ibid., iv, p. 611].

In terminating, some notes are given on the varieties of apples that are especially subject to spray injury in Ohio.

KOHL (E. J.). **The cycle of infection in Apple blotch.**—Abs. in *Phytopath.*, xviii, 1, p. 145, 1928.

In an experimental block of 60 young Duchess apple trees at Vincennes, Indiana, in which the blotch [*Phyllosticta solitaria*] cankers have been excised since 1922 and no sprays given since 1925, counts of petiole infection were made in August, 1927, and the origin of infection determined. Infection was traced to 6 cankers on 1924, and to 72 cankers on 1925 wood, but none to those on 1921, 1923, or 1926 wood, indicating that the cycle of infection is at least two years in length. On potted trees in two other localities infection occurred, respectively, during 18 out of 27 rainy periods between 3 days and 7 weeks after petal fall (7th May), and during 15 out of 17 such periods between 5 days and 6 weeks after petal fall (25th April).

ADAMS (J. F.). **Sulphur sprays in relation to control of fruit spot.**—*Trans. Peninsular Hort. Soc. (1928)*, xvii, 3, pp. 23–26, 1 fig., 1928.

Sulphur sprays applied in July having failed to control *Phoma* fruit spot of apple [*P. pomi*: *R.A.M.*, iii, p. 587; v, p. 432] in Delaware, where evidence was obtained of field infection occurring as early as April and May, an experiment was conducted with trees given a delayed dormant spray of soluble sulphur and sunoco oil on 25th March, 1927, to test the relative efficiency of lime-sulphur, a proprietary form of dry sulphur (emulsoid), and Bordeaux mixture 2–5–50. Only the last-named gave practical control, but it caused such severe russeting of the fruit that its use is not recommended. The suggestion is made that all fallen leaves should be ploughed under before 1st April, in order to prevent infection from the perfect stage of the organism, perithecia similar to those

described by Walton and Orton [*Mycosphaerella* ? *pomi*: loc. cit.] having been found by the author on overwintered leaves.

FROMME (F. D.). **Studies on black root rot of Apple.**—Abs. in *Phytopath.*, xviii, 1, p. 145, 1928.

The causal organism of black root rot of apple (*Xylaria mali* nom. nov.) in Virginia and other parts of the United States [*R.A.M.*, iv, p. 353; vi, p. 581] is stated to be an active parasite producing disease and death in trees of normal vigour. The death of 28 per cent. of trees of the initial stand has occurred in one orchard at 25 years old, while the replant deaths amount to 42 per cent. at 7 years. The fungus forms stromata during the advanced stages of the disease. Norway maple [*Acer platanoides*] and Mahaleb cherry [*Prunus mahaleb*] are also severely attacked by *X. mali*, which occurs to a slighter extent on certain other deciduous trees. Some progress has been made in attempts to control this disease by the development of resistant root-stocks.

GARDNER (M. W.). **Sporotrichum fruit spot of Apple.**—Abs. in *Phytopath.*, xviii, 1, p. 145, 1928.

Roughly circular, slightly sunken, light brown spots, 5 to 15 mm. in diameter, with an indistinct margin and a silvery centre, have been observed in southern Indiana on Grimes, Ben Davis, and Winesap apples on removal from cold storage. A fungus growing well at low temperatures and closely resembling cultures of *Sporotrichum malorum* Kidd and Beaumont [*R.A.M.*, iv, p. 174] was constantly associated with these lesions. Inoculation tests with pure cultures of this organism showed that the mycelium will invade the uninjured fruit and produce small lesions round the lenticels.

CURTIS (K[ATHLEEN] M.). **The morphological aspect of resistance to brown rot in stone fruit.**—*Ann. of Botany*, xlii, 165, pp. 39-68, 64 figs., 1928.

After a brief review of previous work on the question of the resistance of stone fruit, and more particularly of plums, to brown rot (*Sclerotinia cinerea*) [*R.A.M.*, vi, p. 425], the author gives a detailed account of the results obtained in her investigation of the morphology of a number of named commercial varieties of plums, cherries, nectarines, peaches, and apricots in relation to the various degrees of resistance exhibited by them to the fungus. The structure of the cuticle was found to play a part at least equal to (sometimes definitely greater than) that of the stomata in determining the relative resistance of a variety, as in all the fruits tested the fungus was able to gain entry by piercing the cuticle, even though in some cases penetration in this way was slow and of no practical significance. This method of entry was well exemplified in the case of the Yellow Cherry plum which, although entirely lacking stomata and lenticels, is a susceptible fruit owing to the cuticle being thin and weak over some areas. Speaking generally, if the cuticle of a stone fruit is weak, the morphology and number of stomata are of no great importance, but in plums, if the cuticle is resistant, then the total number of stomata present is of more

significance in deciding the resistance or susceptibility of the fruit than their structure. The nature of the hypoderm plays a late, but often effective part in furthering resistance or susceptibility. Plugging of the stomatal chamber, either by a proliferation of thin-walled hypodermal cells or the development of a stomatal lenticel, was not found to have the general relation to resistance suggested by Valleau (*Journ. Agric. Res.*, v, p. 365, 1915–16).

In the varieties studied the brown rot fungus usually gained entry in plums through the stomata, in apricots through the stomata or the cuticle, in peaches down a hair socket, and in cherry (only one variety of which was examined) and nectarines through the cuticle. A synopsis of the anatomy and reaction to infection of the different varieties studied is appended.

PERROT (E.). **Observations au cours d'un récent voyage en Afrique occidentale.** [Observations made during a recent journey in West Africa.]—*Rev. Path. Vég. et Ent. Agric.*, xv, 2, pp. 36–39, 1928.

In the present note, which is the outcome of a journey through French West Africa, the author states that the most important disease of cultivated plants in French Guinea appears to be a blackening of the rachis of banana bunches. Although in some cases the trouble may be attributed to a physiological disorder of the trees due to climatic or soil conditions, the fact that in many instances bunches weighing 40 to 50 kg. each have also been found attacked would rather indicate some parasitic cause. In his opinion the bacteria which have been several times isolated from diseased bunches are but secondary organisms, and he mentions the recent discovery at the Institut Pasteur in Pastoria of an undetermined fungus constantly associated with the trouble. This fungus was isolated from all the tissues of diseased plants, from the roots up to the level of the bunches. It is believed to be always present in the soil of banana plantations and to gain entry to the plants through the roots.

WOLF (F. A.). **Further observations on Corticium koleroga (Cke.) v. Höhn.**—Abs. in *Phytopath.*, xviii, 1, pp. 147–148, 1928.

The recent discovery of *Corticium koleroga* on an isolated planting of citrus in the Everglades suggests that the thread blight disease [*R.A.M.*, vii, p. 247] is endemic to that section of Florida. Additional hosts of the fungus include the coral tree (*Erythrina cristagalli*), privet (*Ligustrum vulgare*), a climbing rose, and *Diospyros kaki.*

QUANJER (H. M.). **Bridging hosts.**—*Rec. Trav. Bot. Néerlandais*, xxv a, pp. 250–259, 1928.

The author discusses the conception of 'bridging hosts' in the bacteria and fungi and concludes that there is good evidence for their existence in less specialized pathogens, such as *Bacterium solanacearum* and species of *Colletotrichum*, while in highly

specialized parasites like the Uredinaceae and Erysiphaceae the belief that bridging hosts occur has proved untenable.

He refers briefly to Honing's work on *Bact. solanacearum*, which was found as a parasite not only of Solanaceae, but also of Urticaceae, Leguminosae, Verbenaceae, and Compositae, while the number of affected families has recently been extended to fifteen by the researches of Palm and Jochems [*R.A.M.*, iv, p. 318]. Honing found that *Bact. solanacearum* gradually loses its virulence in culture, first towards chilli (*Capsicum annuum*), later towards tobacco, and finally towards eggplant (*Solanum melongena*) and tomato. Virulence was restored by the passage of the organism through *Mucuna* sp., and it is concluded that the differentiation of *Bacillus* [*Bact.*] *nicotianae* Uyeda from *Bact. solanacearum* in Japan [ibid., vii, p. 122] is invalid since it is only based on partial and temporary loss of infectivity and not on genetic characters.

Muller has recently found [ibid., vi, p. 322] a form of *Gloeosporium fructigenum* on a diseased pod of *Phaseolus multiflorus* growing under an apple tree. This host acted as a bridge between apple and tomato on the one hand and *P. vulgaris* on the other. Isolated on agar plates the fungus differed markedly in its mode of growth from strains of *C. lindemuthianum*, and it was identified as a new form of *G. fructigenum* which Muller named f. *hollandica*. One plant of *P. multiflorus* inoculated with this form developed well-marked symptoms of disease, and in its turn this plant, which differed in genotype from the others, exerted a peculiar influence on the fungus. On reisolation in monospore cultures, two morphologically new forms of *Gloeosporium* developed, one of them with a marked increase of virulence towards beans. Inoculation experiments on apples and tomatoes with *G. fructigenum* f. *hollandica*, and reisolation from these fruits, resulted in the development of a form with increased virulence towards them.

WOLLMAN (E.). **Bactériophagie et processus similaires. Hérédité ou infection?** [Bacteriophagy and similar processes. Heredity or infection?]—*Bull. Inst. Pasteur*, xxvi, 1, pp. 1–14; 2, pp. 49–56, 1928.

The author's survey of the literature on bacteriophagy and kindred phenomena up to date has led him to maintain the view (to which his own investigations give support) that a number of manifestations commonly attributed to filterable viruses are explicable on a similar basis to the transmission of hereditary characters [*R.A.M.*, vii, p. 77]. The phenomena (including those of the mosaic diseases of plants and certain tumours of man and animals) ascribed to ultra-microscopic viruses are equally manifested by certain elements of cellular origin associated with the process of heredity [e.g., Darwin's pangenes: ibid., v, p. 241]. Such elements, which are of a relatively stable physico-chemical constitution, transmit their characters, not only directly from parent-cell to progeny, but indirectly from one cell to another through the surrounding medium. This conception of material supports or factors indeed forms the basis of the Mendelian theory.

Hadley (P.). **The Twort-D'Hérelle phenomenon. A critical review and presentation of a new conception (homogamic theory) of bacteriophage action.**—*Journ. Infect. Dis.*, xlii, 4, pp. 263–434, 1928.

The general conclusion reached by the author as the outcome of his comprehensive studies on the Twort-d'Hérelle phenomenon may be summarized as follows. Kabeshima's view (*Comptes rendus Soc. de Biol.*, lxxxiii, p. 219, 1920) of the pro-enzyme nature of the lytic agent is not supported by any recent evidence, and may probably be explained by the now recognized occurrence of 'incitants' which instigate the elaboration of the lytic principle by the bacteria themselves. A clear distinction must be drawn between these inciting agents and the actual transmissible principle. Recent evidence establishes the probability that this principle is a living factor possessing a corpuscular form, the most significant property of which is to transform, rather than destroy, the cells.

The views, however, that this factor is an organism, whether belonging to the ultra-microscopic virus group [*R.A.M.*, vii, p. 386] or the minute 'spore form' of a Myxomycete as claimed by Kuhn, Koch, and Ziegenspeck [ibid., vii, p. 107], are regarded by the author as opposed to some of the main facts now recognized in the bacteriophagic reaction. The working hypothesis advanced in this paper is that the bacteriophage is either a definite stage in the cyclogeny of the bacterial species itself, or a functionally active particle accessory (i. e., possessing complementary or reciprocal biological significance) to one of these stages. In such a conception there is no priority of significance in the relation between the bacteriophage corpuscle and the cell which generates it or which it 'attacks'. Both elements are necessary components of a definite reproductive mechanism possessed by many, if not by all, bacteria. This constitutes the nucleus of what may be termed the 'homogamic' theory of the bacteriophage. Observations are made on the connexion between the writer's hypothesis and the work of previous investigators, with suggestions for the further investigation of the problem.

A bibliography of nine pages is appended.

Doak (K. D.). **The mycorrhizal fungus of Vaccinium.**—Abs. in *Phytopath.*, xviii, 1, p. 148, 1928.

In 1925 and 1926 a non-pathogenic fungus was found associated in different soils of northern Indiana with the roots of blueberry (*Vaccinium corymbosum*, *V. vacillans*, and *V. pennsylvanicum*). The organism developed intracellular, glomerulous masses, hyaline strands, and a brownish, appressed external growth on roots in contact with organic particles, and produced an endotrophic mycorrhiza similar to that previously described in *V. corymbosum*. A fungus resembling *Rhizoctonia* was isolated from *V. corymbosum* and *V. pennsylvanicum*, the mycelial characters of which in culture resembled those of the fungus on the roots. The inoculation of sterile seedlings with this *Rhizoctonia* resulted in the development of the mycorrhiza. Normal root and stem development were not dependent on the presence of the fungus, but seedlings transferred into unsterilized leaf mould and sphagnum peat grew more rapidly

when roots already possessing the fungus were added. No evidence of direct nutritive symbiosis was forthcoming.

PESSIN (L. J.). **Mycorrhiza of Southern Pines.**—*Ecology*, ix, 1, pp. 28–33, 1 pl., 1928.

Numerous mycorrhiza were found on the roots of seedlings of *Pinus palustris, P. echinata, P. caribaea*, and *P. taeda* at the Southern Forest Experiment Station, Bogalusa, Louisiana. These are produced by a fungus apparently belonging to the Hymenomycetes and occur mainly on the lateral branches of the roots in the upper soil layers. The silvery-grey, later ashen mycorrhiza of *P. echinata* measure 1·5 by 0·5 mm. and are mostly dichotomously branched. Those of *P. taeda* measure 2 by 0·5 mm.; they are yellowish when young and turn greyish-brown later. The mycorrhiza of *P. caribaea* resemble those of *P. taeda*, both being dichotomously branched, but they become silver-grey at maturity. The buff to light brown mycorrhiza of *P. palustris* are considerably longer (2·5 by 0·7 mm.). The great abundance and mode of distribution of the mycorrhiza, when taken together with the vigour of the affected seedlings, suggests beneficial symbiosis rather than parasitism.

SENN (G.). **The assimilation of the molecular nitrogen of the air by lower plants, especially by fungi.**—*Biol. Reviews & Biol. Proc. Cambridge Philosoph. Soc.*, iii, 1, pp. 77–91, 1928.

This is a review of the literature dealing with the fixation by fungi and bacteria of the molecular nitrogen of the air. Reference is made, *inter alia*, to Miss Rayner's work on the mycorrhiza of the Ericaceae and Wolff's studies on the endophytes of *Neottia nidus avis* and various green orchids [*R.A.M.*, vi, p. 743]. The view is maintained that fungi and bacteria, by assimilating the molecular nitrogen of the air, keep the quantity of nitrogen compounds constant on the surface of the earth. Electric discharges in the atmosphere assist in this process of nitrogen regulation. Thus these organisms, by the part they play in the circulation of nitrogen, help to realize one of the chief conditions for the continuity of life.

LAIBACH (F.). **Über Zellfusionen bei Pilzen.** [On cell fusions in fungi.]—*Planta, Arch. Wissensch. Bot.*, v, 2, pp. 340–359, 21 figs., 1928.

The author fully describes his studies on the cytology of *Coniothyrium fuckelii* and its ascigerous stage *Leptosphaeria coniothyrium* from raspberry canes [*R.A.M.*, vi, p. 739], and of *Monilia fructigena* and *M. cinerea* (the conidial stages of *S. fructigena* and *S. cinerea*, respectively) from apples [ibid., vi, p. 619].

Cell fusions similar to those occurring in the Ustilaginaceae [ibid., vii, pp. 150, 151] were observed in pure cultures of these Ascomycetes on various nutrient media at room temperature. In both families certain species fuse soon after the germination of the conidia or sporidia, respectively, while in others no tendency to anastomosis is shown. This distinction is even apparent in species

of the same genus. Thus, no fusions were observed in *C. concentricum* (closely allied to *C. fuckelii*) from *Yucca* leaves [ibid., vii, p. 12] or between the sporidia of *Ustilago zeae* [ibid., vii, p. 372].

Both in the Ascomycetes and in the Ustilaginaceae the fusion hyphae exhibit the phenomenon of attraction. Multiple fusions frequently occur in the Ascomycetes, and Boss (*Planta*, iii, 1927) has observed a similar manifestation in the Ustilaginaceae. None of these fusions can, in the author's opinion, be taken to represent sexual copulation. They do not appear to be due so much to nuclear attraction as to a nutritional need, and in some cases at least the nucleus of one cell does not pass into the other cell, but both move with their surrounding protoplasm into the germ-tube that arises from the fusion-bridge, just as nuclei and protoplasm often migrate to the growing tip of a hypha and leave the part behind empty. That this is not a sexual phenomenon is supported by the fact that fusion occurs most readily in cultures that are not under optimal conditions for the growth of the fungus. In both the Ascomycetes and the Ustilaginaceae certain definite cultural conditions influence fusion, a low nutrient concentration favouring it, and a high one impeding it in both families.

The Ascomycetes studied by the author do not show heterothallism, and most representatives of this family are originally homothallic, the heterothallic genera being thought to be undoubtedly of homothallic descent.

It is believed to be apparent from the results of these investigations that there are no essential physiological differences between the Ascomycetes and the Ustilaginaceae in the matter of fusion. It cannot, however, be denied that both the vegetative and the pseudo-sexual types of fusion somewhat resemble the true sexual process as exemplified in the Mucorineae, thus suggesting a closer connexion between the various forms of anastomosis and conjugation than is generally recognized.

A bibliography of 24 titles is appended.

DUFRÉNOY (J.). **Some cytological phenomena in disease-resistant plants.**—Abs. in *Phytopath.*, xviii, 1, p. 144, 1928.

Certain species of *Phytophthora* live primarily in the meristematic tissues of the cambial regions of roots and stems [*R.A.M.*, vi, p. 224]. As soon as the invading tips of the hyphae enter any part of the cambial tissue, they induce the cells at some distance to divide in a transverse plane and to form a pathological cambial layer. This layer consists of two types of cells: (*a*) those on the side away from the infected tissues, containing large nuclei, dense cytoplasm, and mitochondria; (*b*) those on the side towards the infected tissues, developing large vacuoles which accumulate tannoid compounds, fuse, and crowd the cytoplasm and nuclei to the periphery of the cells. If the fungus grows quickly enough to invade the meristematic cells of the pathological layer before the development of the large vacuoles with tannoid compounds, it will continue to thrive at the expense of the host cells; otherwise it is starved and the lesions are arrested.

SCHNEIDER (G.), SCHLUMBERGER (O.), & SNELL (K.). **Versuchsergebnisse auf dem Gesamtgebiete des Kartoffelbaus in den Jahren 1923–1926. VIII. Krankheiten und ihre Bekämpfung.** [Results of experiments in all branches of Potato cultivation in the years 1923–1926. VIII. Diseases and their control.]—*Mitt. Biol. Reichsanst. für Land- und Forstwirtsch.*, 36, pp. 102–113, 1928.

In an experiment in the control of late blight of potatoes (*Phytophthora infestans*) conducted under the supervision of the Hanover Chamber of Agriculture in 1926, the best results were given by spraying with 1 per cent. Bordeaux mixture, which increased the yield of the Odenwälder Blaue variety from about 228 to 377·6 cwt. per hect., and that of Up-to-Date from 94·4 to 174·2 cwt. per hect. Moderately satisfactory results were also given by a dust (No. 1236) supplied by Meyer (Mainz), but vomasol (1 and 2 per cent.) [*R.A.M.*, vii, p. 245] was ineffective.

The outcome of experiments at Dresden in the control of wart disease [*Synchytrium endobioticum*] by disinfection of the soil with ammonia, germisan, uspulun, chinosol, or formalin was entirely negative.

The germination of seed-potatoes was found to be accelerated by immersion for varying periods in 0·25 per cent. uspulun. Abavit and tutan dusts and germisan bolus considerably impaired germination. The development of *P. infestans* was practically suppressed by two hours' immersion in 0·5 per cent. copper sulphate, especially on the Edeltraut variety, but germination was retarded at this concentration.

Investigations pursued in 1926 at the phytopathological sections of the Bonn-Poppelsdorf and Landsberg-an-der-Warthe Agricultural Colleges show that the tuber is the main source of mosaic infection, the symptoms of which are discernible shortly after germination in the progeny of diseased plants. Hence the surest method of preventing the dissemination of infection is the immediate roguing of diseased plants, if possible before the appearance of the aphid vectors. The artificial transmission of potato mosaic virus was much more difficult than in the case of tomato and tobacco mosaic, uniform results being secured only by grafting and transplantation of tissues. In all inoculation experiments the incubation period of mosaic was of long duration, older plants showing no symptoms of infection in the current season. The observations made in 1926 on the correlation between mosaic and an accumulation of a yellow pigment of the xanthin group [ibid., vi, p. 13] were confirmed.

Aardappelziekten waarmede rekening moet worden gehouden bij de veldkeuring en bij de selectie. [Potato diseases to be considered in field inspections and in selection.]—*Versl. en Meded. Phytopath. Dienst. te Wageningen* 6, 24 pp., 7 pl. (1 col.), 1928.

This is a revised edition of a pamphlet of the same series which appeared in 1920. The present paper includes an account of stipple-streak [*R.A.M.*, vii, p. 49] and other supplementary notes based on recent investigations. A scheme for the development of

healthy strains of varieties by means of selection is outlined, and a table is given showing the reaction of a number of the most widely grown potato varieties in Holland to the chief diseases of the crop.

SCHANDER [R.] & BIELERT. **Nekrose und andere Degenerationserscheinungen im Phloem der Kartoffelpflanze.** [Necrosis and other degeneration phenomena in the phloem of the Potato plant.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xv, 5, pp. 609–670, 4 pl., 1928.

After a general survey and discussion of the literature on phloem necrosis as a concomitant of leaf roll of the potato since its discovery by Quanjer in 1913, the writers seek to reconcile the conflicting opinions prevailing on this subject by the differentiation of two types of necrosis, namely, the acute (restricted to diseased plants and invariably found in true leaf roll, while occasionally present in some other forms of disease), and the so-called 'senility necrosis', associated with the natural changes due to advancing age in both healthy and diseased individuals but considered to be distinct from the necrobiosis and obliteration phenomena described by v. Bremer [*R.A.M.*, iii, p. 417; vi, p. 13]. The symptoms occurring in both forms of phloem necrosis are distinguished and contrasted in a table. In the acute form the affected tissues are coloured red with phloroglucin and hydrochloric acid, indicating a lignification of the cell walls, whereas this reaction is not given in senility necrosis. Associated with the collapse of the phloem cells in both forms of necrosis is an increase in size of the neighbouring parenchyma cells, but this is much more marked in the acute form than in the other, and may even be absent in the latter.

The authors' observations indicate that acute necrosis results from some alteration in the leaves of the plant, so that the necrosis is not the primary symptom of the disease.

The results of extensive anatomical investigations on 33 plants of ten varieties affected by true leaf roll [ibid., vi, p. 633] showed that acute phloem necrosis was present in all cases, and that, in general, the intensity of this phenomenon was proportionate to the external symptoms. The examinations of two sections of the sixth foliage leaf (counting from below) of a diseased plant showed that section (1), made through the petiole 0·5 cm. from the base, contained a moderate number of acutely necrosed and partially discoloured areas in both the outer and inner phloems of the bicollateral bundles. The necrotic condition was most prominent in the outer phloem of the two large groups of vascular bundles. Section (2), made through the rachis between the penultimate large pair of pinnate leaflets and the smaller pair above, showed very few acutely necrosed areas, but contained (in contrast to the section through the petiole) an exceptionally large quantity of starch, particularly in the endodermis, the medullary rays, and the parenchyma cells of the ground tissue adjoining the inner phloem strands. The general correlation between the external and internal manifestations of phloem necrosis is exemplified by further data of a similar order.

Leaf roll of the tip of the shoot ('Gipfelrollen') [loc. cit.] was found to produce a corresponding internal necrosis, especially in the

outer phloem of the upper part of the stem and in the upper rolled leaves. Occasionally necrosis of the inner phloem was also observed, but as a rule the number of acutely necrosed areas in the vascular bundles of the stem was smaller than in plants suffering from true leaf roll. No accumulation of starch was observed in the leaves of affected plants, as in the case of true leaf roll, though an aggregation of translocatory starch was found in the ground tissue of the stems and petioles, where the diastatic processes were disturbed. This form of leaf roll is considered to be due to various causes, the phloem necrosis associated with it being found accompanied by blackleg, soft rot, and tuber formation in the axils of the foliar shoots, the first-named correlated with the acute form of necrosis, and the others with that due to senescence.

The examination of plants affected by *Rhizoctonia* leaf roll [resulting from infection by *Corticium solani*: loc. cit.] showed that acute phloem necrosis may or may not be present. There was no indication of starch accumulation in the ground tissues in this disease.

No correlation was observed between phloem necrosis and the rolling of the leaves that develops in the acidity disease of potatoes, which occurred in pots at Landsberg in 1925 and was experimentally produced in 1926 by cultivation in strongly acid soils [loc. cit.].

The 'bouquet' disease [*R.A.M.*, vii, p. 259] was found to be associated with the natural form of phloem necrosis incidental to advanced age; there was no accumulation of starch in the one plant available for examination, and no trace of acute necrosis. A plant affected by Barbarossa disease [ibid., iii, p. 100 *et passim*], and derived from material showing the apparently hereditary symptoms of this disturbance for three consecutive years, exhibited acute phloem necrosis of all parts of the stems and foliage. Another plant grown in the open, however, showed no trace of the acute form of the necrosis, though obliteration of the sieve-tubes outside the three large vascular bundles of the stem was observed in places. Owing to the paucity of available material, no definite statement as to a correlation between acute phloem necrosis and the bouquet and Barbarossa diseases can be made, but it seems probable that such a connexion exists in the latter, but not in the former case.

Generally speaking, the outcome of the writers' investigations on the diseases of the curl type distinguished by Quanjer [ibid., iii, p. 415] is in agreement with the results obtained in Holland.

Particulars are given of the anatomical examination of healthy plants, and of various observations made in connexion with the occurrence and development of phloem necrosis. Experiments were conducted in the transmission of the condition by various methods, none of which gave entirely conclusive results. A discussion is given of Beijerinck's phenomenon of necrobiosis, which the authors have observed usually in the inner phloem. Obliteration of the phloem was also observed, usually in the older tissues of the stem. Both these forms of degeneration, which are not sharply differentiated from one another, appear to be more or less associated with senescence. Two other manifestations of degeneration occasionally occurred in the authors' plants and are concisely described, namely,

necrosis of the fundamental tissue of the stems and petioles (possibly identical with net necrosis) [ibid., vi, p. 311], and xylem necrosis which mostly occurs in healthy plants and requires further elucidation. The senescent form of phloem necrosis was found to a limited extent in *Solanum nigrum*, *Nicandra physaloides*, *Scopolia atropoides*, tobacco, and *Atropa belladonna*, while necrobiosis also occurs in tomatoes. There was no indication of acute phloem necrosis or obliteration in any other plant than the potato.

TSEN-CHENG. **Sur les modifications histopathologiques constatées chez la Pomme de terre (Solanum tuberosum) atteinte de dégénérescence (maladie de l'enroulement).** [Histopathological modifications observed in Potatoes (*Solanum tuberosum*) affected with degeneration (leaf roll).]—*Comptes rendus Acad. des Sciences*, clxxxvi, 8, pp. 524–526, 1928.

A histological study showed that in potato plants affected with leaf roll the morphological elements of the leaves undergo deep modifications which attain a maximum in the plants that exhibit the most marked symptoms of the disease. Thus, in diseased leaves all the cells are hypertrophied (the palisade cells being 120 by 24 μ in diameter as against 80 by 14 μ in healthy leaves) and have thickened walls, while the cytoplasm is very dense, rich in fatty substances, and encloses a large vacuole containing abundant protein and tannin compounds and an enlarged nucleus. In healthy leaves, on the other hand, the cytoplasm is not abundant, rather poor in fatty substances, and the vacuole does not show any considerable accumulation of protein and tannin compounds. In diseased leaves the contents of the vacuole in the cytoplasm are very acid (about P_H 3 as against 6 in healthy leaves). It was also found that in the initial stages of the disease the osmotic pressure of the cell sap was very high, since the cells of young diseased leaves were but slightly plasmolysed by high concentrations of saccharose or salt solutions which cause an immediate collapse of the cells in healthy leaves. Beauverie's statement that there is a reduced osmotic pressure in the cytoplasm of leaf roll potato plants [*R.A.M.*, v, p. 753] is believed to have been probably due to the fact that he investigated leaves in an advanced stage of the disease.

The histological modifications described above are considered to be specific and well-defined symptoms of potato leaf roll, for when diseased plants that had germinated in daylight were transferred to a comparatively dark place and maintained at a temperature of from 20° to 25° C., all the outward symptoms disappeared within a month and there was simultaneously a considerable reduction in the acidity of the cytoplasm and in the amount of protein and tannin compounds and of starch in the leaf tissues.

JOHNSON (J.). **The properties and behaviour of Potato rugose mosaic.**—Abs. in *Phytopath.*, xviii, 1, p. 141, 1928.

The properties of certain viruses are being determined with a view to a more satisfactory classification of potato virus diseases [*R.A.M.*, vi, pp. 501, 502; vii, p. 256]. The rugose mosaic virus [ibid., iii, p. 548], for instance, will not yield good infection at a

dilution much greater than 1 part of mosaic plant extract to 10 parts of water. The extracted virus loses its infectivity rapidly *in vitro*, about half being lost after 6 and all after 24 hours. The thermal death-point of the rugose mosaic virus lies close to 43° C. Bliss Triumph and Green Mountain proved to be the most susceptible to rugose mosaic and Rural New Yorker the most resistant of the varieties tested. All attempts to pass this virus through bacterial-proof filters have so far failed. In general, the properties of the potato rugose mosaic virus are quite different from those of certain other potato viruses studied, e.g., leaf rolling mosaic and spot necrosis.

Goss (R. W.). **Transmission of Potato spindle-tuber by grasshoppers (Locustidae).**—Abs. in *Phytopath.*, xviii, 1, p. 140, 1928.

While aphids have been shown to transmit spindle tuber [*R.A.M.*, iii, pp. 297, 548] they are not sufficiently numerous in the potato-growing districts of western Nebraska to account for the rapidity with which the disease sometimes spreads. Tests were therefore made with some of the more common insects occurring in potato fields. In 1925, 8 inoculations with grasshoppers resulted in typical spindle tuber, the corresponding figures in 1926 being 29 out of 64. Uncaged control plants remained consistently healthy, and the possibility of uncontrolled field transmission by any other means is negligible. Current season symptoms did not occur in many cases, so that it was necessary to index the progeny in the greenhouse and plant the tubers in the field the following year to obtain these data. In the 1926 experiments it was found that 5 of the 77 plants on which the grasshoppers were fed before being placed on spindle tuber plants became infected. Apparently some of these insects carried the infective principle when collected.

Richards (B. L.). **A new and destructive disease of the Potato in Utah and its relation to the Potato psylla.**—Abs. in *Phytopath.*, xviii, 1, pp. 140–141, 1928.

A new and destructive disease has recently swept the potato fields of Utah, the western slope of Colorado, southern Idaho, Montana, and Wyoming. The first and most distinctive symptom is an upward rolling of the basal portion of the young leaves, which in the Bliss Triumph and Irish Cobbler varieties assumes a brilliant light pinkish-yellow to purple colour. The older leaves roll upward, turn yellow, and die. The axillary buds are stimulated into one or more of three types of growth: thick shoots which may exceed the leaf in length, the formation of aerial tubers, and rosettes of small and often highly coloured leaves. In most of the affected regions the potato psylla (*Paratrioza cockerelli*) was found associated with diseased plants, and experiments under controlled conditions showed that the nymph of this insect is in some way responsible for the development of infection. Nymphs confined by gauze bags to a single lower or older leaf produce the early symptoms of the disease (for which the name 'yellows' is suggested) in remote portions of the plant in nine days.

SCHLUMBERGER [O.]. **Prüfung von Kartoffelsorten auf ihr Verhalten gegen Schorf im Jahre 1927.** [Trial of Potato varieties for their reaction to scab in the year 1927.]—*Mitt. Deutsch. Landw. Gesellsch.*, xliii, 2, pp. 33–35, 1928.

In continuation of his studies on potato scab (*Actinomyces*) [*scabies*: *R.A.M.*, vi, p. 573] the writer describes a new method of classifying varietal resistance to this disease and discusses the results of its application in 1927. One hundred tubers of each variety to be tested are sorted into six groups according to the degree of infection: (1) more than $\frac{3}{4}$ of the tuber surface attacked; (2) between $\frac{1}{2}$ and $\frac{3}{4}$; (3) between $\frac{1}{5}$ and $\frac{1}{2}$; (4) less than $\frac{1}{5}$; (5) isolated pustules; and (6) free from scab. The number of tubers in each group is then divided by 10 and the quotient approximated to the nearest digit. The number obtained by arranging these digits in sequence from groups 1 to 6 thus indicates the susceptibility of any given variety. For instance, Cimbal's Alma is represented by the number 042220, denoting that none of the tubers showed either the maximum or minimum degrees of infection, while 40 per cent. fell in group (2), and 20 per cent. in each of groups (3), (4), and (5).

The total number of varieties tested in 1927 was 61, of which 34 had already been submitted to trial in 1926. A comparison of the figures for the two years [presented in tabular form] shows that, in general, the varieties heavily infected in 1926 reacted similarly in 1927; on the basis of these data Alma, Böhm's Allerfrüheste, and Daber should be excluded from further trial on the ground of extreme susceptibility. Kuckuck, however, which was very resistant in 1926, proved highly susceptible during the current season, indicating that the characters determining varietal reaction may be liable to fluctuation.

MÜNTER (F.). **Arbeiten der agrikultur-chemischen Versuchsstation Halle a. d. Saale. VI. 9. Kalkdüngung und Schorfigkeit der Kartoffeln.** [Operations of the Experiment Station for Agricultural Chemistry Halle a. d. Saale. VI. 9. Fertilization with lime and scabbiness of Potatoes.]—*Landw. Jahrb.*, lxvii, 1, pp. 90–91, 1928.

The results of experiments carried out in 1923 and 1924 to ascertain the effect of applications of lime (about 80 cwt. per hect.) on the incidence of potato scab [*Actinomyces scabies*] are briefly described. There was no evidence that infection is increased by the addition of lime to the soil, either in the current year or the next one. On the other hand, considerable differences in varietal reaction to the causal organism were shown, Pepo being much more susceptible in 1923 than Thiele's Früheste and Weisse Riesen (90 and 2 to 5 per cent. infection, respectively). However, the fact that in 1924 Pepo was practically free from infection in exactly the same spot suggests that such differences are not constant but vary according to the season [see also last abstract]. The application to the soil of physiologically acid fertilizers increased the yield but failed to control scab.

APPEL [O.]. **Die Verhinderung der Ausbreitung des Kartoffelkrebses.** [The prevention of the spread of Potato wart.]—*Deutsche Landw. Presse*, lv, 4, p. 57, 1928.

Attention is drawn to the prevalence of wart disease of potatoes [*Synchytrium endobioticum*] in small holdings, allotments, and the like, chiefly in the industrial districts of western Germany, whence infection is disseminated to other parts of the country. Shortly after the war infected material was also introduced from abroad into Thuringia, and quite recently diseased potatoes have been imported from Poland. It is essential to eliminate these centres of infection, not only by prohibiting the removal of potatoes from one locality to another, but also by the consistent use of immune varieties, the number of which has risen considerably in recent years and amounted to 40 per cent. of those tested in 1927–8 [*R.A.M.*, vii, p. 50]. Owing to the dominant character of the hereditary factors conferring immunity from wart disease, the development of such varieties is comparatively simple and a steady increase in their numbers may be confidently expected.

HENNE (W.). **Der Kartoffelkrebs im Saargebiet.** [Potato wart in the Saar district.]—*Deutsche Landw. Presse,* lv, 4, p. 57, 1 fig., 2 graphs, 1928.

Wart disease of potatoes [*Synchytrium endobioticum*: see preceding abstract] first appeared in the Saar district of Germany in 1924, since when it has spread over 27·17 hect. in 27 parishes. The conditions in the infected areas are similar to those prevailing in the industrial districts of the Ruhr, a large part of the population being employed in mines and foundries.

WEISS (F.) & BRIERLEY (P.). **Factors of spread and repression in Potato wart.**—*U.S. Dept. of Agric. Tech. Bull.* 56, 13 pp., 1 pl., 1928.

The authors state that experiments and field observations have conclusively shown that potato wart disease (*Synchytrium endobioticum*) may be disseminated by the viable sporangia of the fungus that adhere to healthy tubers as effectively as by actually infected tubers, and that the simultaneous transfer of host and parasite is much more effective in spreading the disease than the dissemination of the sporangia alone. This explains to a large degree the fact that the prohibition of export of contaminated seed from infected areas in eastern Pennsylvania has successfully checked the spread of the potato wart disease into other agricultural areas in the United States.

Experiments made with a view to eliciting the part played by tomatoes in the perpetuation of the disease in infected areas showed that among the 65 varieties of tomatoes tested none was resistant. Infection of the tomato was found to be favoured by the same conditions of temperature (15° to 18° C.) and of soil moisture as those that ensure a copious infection of the potato [*R.A.M.*, iv, p. 764]. Although the galls formed on the tomatoes are usually small, they occasionally attain a size that might be significant in perpetuating soil contamination. All parts of the aerial system of the tomato

have been found to be susceptible, but in the authors' experience root infection does not occur.

Some details are also given of experiments carried out to test the resistance of resting sporangia of *S. endobioticum* to heat and desiccation. The results showed that the sporangia were unable to infect susceptible potatoes after exposure to moist heat for 2·5 minutes at 100° C. or for two hours at 60°, but that they resisted dry heat for 10 to 12 hours at 100°, and for 6 or 7 days at 60°. Resting sporangia adherent to tubers were not killed by ordinary seed disinfection with formalin or mercuric chloride.

Potato blight.—*Govt. of Northern Ireland, Min. of Agric. Leaflet* 50, 6 pp., 1 pl., 1928.

Besides a brief, popular account of potato late blight [*Phytophthora infestans*], this leaflet contains recommendations for the control of the disease, and instructions for the preparation of 1 and 2 per cent. Bordeaux and Burgundy mixtures. The 1 per cent. Bordeaux mixture recommended consists of 4 lb. copper sulphate and 2 lb. lime to 40 galls. water, and the 1 per cent. Burgundy mixture of 4 lb. copper sulphate and 5 lb. washing soda in crystals to 40 galls. water, the proportions of copper sulphate and lime or soda being doubled for the 2 per cent. mixtures. Preference is given to the Burgundy mixtures for the reason that washing soda of guaranteed purity is more easily obtainable than the best quality of burnt lime; that it is easier to work with than lime; that the mixture obtained is less likely to be gritty and clog the nozzle of the sprayers; and finally, that Burgundy mixture adheres better to the leaves and is not so easily washed off by rain as Bordeaux mixture. Notes are given on the dates of application of the mixtures, and the cultural practices tending to reduce the infection of the tubers in the field and in storage.

SCHMIDT (E.). **Schädigungen der Kartoffel durch Pilze der Gattung Fusarium Lk.** [Injuries caused to the Potato by fungi of the genus *Fusarium* Lk.]—*Arb. Biol. Reichsanstalt. für Land- und Forstwirtsch.*, xv, 5, pp. 537–592, 7 pl. (1 col.), 1928.

The results of the author's extensive laboratory and field investigations on the pathogenicity towards potatoes of 26 species of *Fusarium* are fully described and tabulated.

F. coeruleum, *F. viticola*, and *F. avenaceum* were found to cause dry rot of the tubers, the first-named being responsible for the heaviest damage. The *Fusarium* stage of *Gibberella saubinetii* produced depressions in the surface of the tubers extending to a depth of 3 to 4 mm., accompanied by rotted areas up to 1 cm. in diameter, and may therefore be termed quasi-pathogenic. None of the other species tested caused decay, and *F. solani*, frequently reported in phytopathological literature as a parasite, is considered to be a pure saprophyte which is probably liable to confusion with the closely related *F. coeruleum*.

The necessary temperatures for tuber infection are above 10° C. for *F. coeruleum* and over 2·5° for *F. viticola* and *F. avenaceum* [cf. *R.A.M.*, vii, p. 261]. The first-named species will cause infection

at an atmospheric humidity of 50 per cent., while both the others require at least 80 per cent. Under favourable conditions for infection *F. coeruleum* entirely destroys Up-to-Date tubers in four to six weeks, but *F. viticola* and *F. avenaceum* take two to three months to complete the process. Once a tuber is infected by *F. coeruleum*, the rotting progresses slowly even under conditions detrimental to the fungus, whereas in similar cases (especially in dry conditions) the development of *F. avenaceum* and *F. viticola* is impeded by the suberization of the adjacent tissues.

The species under discussion were shown to be typical wound parasites. If the rotting of the seed-tuber advances far enough, the eyes are destroyed. In milder cases the shoots may develop normally, even if the mother-tuber later succumbs to the fungus. Infection was not observed to pass from the seed-tuber to the daughter-tubers. It was found that the inoculation of freshly dug tubers of the Görsdorfer Niere and Modrow's Industrie (Parnassia) varieties with *F. coeruleum* and the other species gave negative results, infection occurring only on tubers beginning to germinate as the result of storage in a warm or damp place. From mid-December until the spring, however, it was possible to infect tubers of these varieties stored in a dry cellar at 8° to 10°. It is suggested that this variation in susceptibility to *Fusarium* infection at different periods may be connected with the fluctuating sugar-content of the tubers. In general the Niere, Industrie, v. Kameke's Beseler, and Richter's Jubel varieties are extremely resistant to *Fusarium* rot, while Böhm's Odenwälder Blaue, Cimbal's Prof. Wohltmann and Silesia, Görsdorfer Up-to-Date, v. Kameke's Kartz v. Kameke, and Lembke's Frühe Rosen and Kaiserkrone proved highly susceptible. These varietal differences, which were specially marked at low temperatures and in dry atmospheres, must be taken into account in all reports containing data on the conditions governing *Fusarium* infection.

In closed glass vessels the following species, normally saprophytic, caused rotting of Industrie tubers: *F. filiferum*, *F. fructigenum*, *F. subcarneum*, *F. culmorum*, *F. sulphureum*, *F. orthoceras*, *F. lutulatum*, *F. vasinfectum* var. *inodoratum*, *F. zonatum*, *F. oxysporum*, *F. martii*, *F. moniliforme* [*G. moniliformis*], and *G. saubinetii*. The conditions to which the tubers were exposed in these containers approximated to those obtaining in badly-ventilated storage rooms or slimy soils.

The pathogenicity of the cultures was not affected by the nature of the medium (acid or neutral) on which they were grown, and in no case were freshly isolated cultures more virulent than those kept in the laboratory for one to three years. A number of strains used in these tests, including *F. oxysporum* and *F. sulphureum*, had already been in culture for 10 to 15 years.

A bibliography of 94 titles is appended.

Boyd (O. C.). **Comparison of various disinfectants in the treatment of Sweet Potatoes for black rot control: a progress report.**—Abs. in *Phytopath.*, xviii, 1, pp. 153–154, 1928.

Sweet potatoes of the Porto Rico variety were inoculated with conidia, ascospores, and chlamydospores of the black rot fungus

(*Ceratostomella fimbriata*) and subjected to a number of liquid and dry treatments, after which the roots were dried and bedded. The lowest percentage (7·1) of infected draws [tuber sprouts] occurred in the lot dusted with Lucas-Kiltone bordo powder (22 per cent. copper), while ten minutes' immersion in mercuric chloride 2 in 1,000, a dip in semesan bel 1 in 20, and corona coppercarb dust (20 per cent. copper) reduced the incidence of black rot from 25·8 to 9·2, 9, and 9·2 per cent., respectively. None of the disinfectants caused any appreciable injury to the plants.

MITCHELL (J.). **Notes on brown bast and its treatment.**—*Trop. Agriculturist*, lxx, 1, pp. 3–4, 1928.

The author states that the combined scraping and isolation method advocated by him for the control of brown bast of *Hevea* rubber in Ceylon [*R.A.M.*, vi, p. 574] has proved even more satisfactory than was anticipated, the coolies showing remarkable skill in diagnosis and treatment. On some treated surfaces tapping was successfully resumed after only 13 months, but in general a longer period should be allowed to elapse, to ensure a suitable thickness of bark. Certain recurrences of the disease after treatment are considered to be due to insufficiently deep scraping.

SCHREINER (O.) & DAWSON (P. R.). **Manganese deficiency in soils and fertilizers.**—*Indus. & Engin. Chem.*, xix, 3, pp. 400–404, 2 figs., 1927.

An account is given of a type of chlorosis of tomatoes in an area bordering on the Florida Everglades, due to manganese deficiency. In pot culture tests with soil from this area, the manganese content of which was found to be under 0·001 per cent., the plants receiving a complete fertilizer, with or without manganese, made approximately equal progress for the first fortnight, after which those without manganese developed a pronounced form of chlorosis. The leaf areas farthest from the major veins turned yellow, giving a mottled appearance to the foliage, which sometimes became completely chlorotic; in many cases necrosis set in, appearing at first as minute brown pin points and expanding to large dead areas. Growth became increasingly spindling, few or no blossoms were formed, and no fruit was produced. On the other hand, the plants receiving manganese as well as the fertilizer developed luxuriantly, blossomed profusely, and formed a considerable quantity of fruit.

The chlorotic condition was absolutely cured in plants receiving an application of manganese sulphate equivalent to about 25 parts per mille of manganese, while similar results have been obtained in later experiments on a larger scale. At least 10 p.p.m. of added manganese was essential, while the best effect was given by 25 to 50 p.p.m. Analysis of the leaves of plants from soil receiving manganese showed a manganese content of 0·0026 per cent. of the dry weight, compared with only 0·00067 per cent. in those grown without the addition of this element. The excellent results given by the addition to the soil of well-rotted manure is attributed to the manganese content of the latter (58 mg. of total manganese in

300 gm. of manure in the sample used. Field experiments confirmed the pot culture tests.

MILLER (L. P.). **Manganese deficiency in sand cultures.**—*Amer. Fertilizer*, lxviii, 7, pp. 21–22, 3 figs., 1928.

Tomato seedlings grown in good greenhouse soil to a height of ten inches and then transferred to pots containing pure quartz sand were treated with a nutrient solution of calcium and potassium nitrates, dipotassium hydrogen phosphate, and magnesium sulphate. In about three weeks the plants developed a condition closely resembling that described as due to manganese deficiency [see preceding abstract]. The addition of 50 mg. of manganese sulphate to each pot resulted in a remarkably rapid improvement, only the almost white necrotic spots remaining to indicate the former condition. When manganese sulphate was added at the beginning of the test chlorosis did not appear.

Starvation symptoms developed almost immediately in plants started directly from seed in sand cultures, but the addition of a small quantity of manganese sulphate (32 mg. per pot) sufficed to stimulate growth, while the controls, receiving no manganese, ceased to develop after a few weeks.

Similar results were obtained in experiments with maize, cabbage, wheat, barley, and tobacco [*R.A.M.*, vi, p. 284; vii, p. 258]. The type of chlorosis induced by manganese deficiency is readily distinguishable by its primary development in areas at a distance from the veins.

SAMUEL (G.) & PIPER (C. S.). **Grey speck (manganese deficiency) disease of Oats.**—*Journ. Dept. Agric. S. Australia*, xxxi, 7, pp. 696–705; 8, pp. 789–799, 5 figs., 1 graph, 1928.

Grey speck of oats [*R.A.M.*, vii, p. 370], the symptoms of which are stated to be identical with those described in Europe, occurs in the south-eastern region of South Australia, mainly on volcanic soils round Mount Gambier and Mount Schanck, and on the black clay soils of drained swamp areas near Penola and Millicent. These soils are alkaline, and the disease (which seems to cause most damage in dry years) is worst on the most alkaline patches; it is pointed out, however, that oats grow very well on the much more alkaline soils of the mallee. Where a fire has been made, the oats are quite healthy, even though the rest of the field is diseased, but this effect is transitory.

Pot experiments with these two types of soil and with two similar soils which had never been observed to produce the disease (Netherby and Urrbrae, respectively), in which P_H values from 5·5 to 8·2 were obtained by treatment with hydrochloric acid or calcium carbonate, gave the following results.

In the Penola series, in all the acid soils the plants remained perfectly healthy, the disease becoming more pronounced as alkalinity increased.

The Mount Gambier soil gave a different result, as in all the pots receiving any acid, except one, the disease did not appear, even when the acid addition was so slight that the soil remained alkaline. From this it would appear that the addition of even a little acid

may release sufficient manganese to prevent the appearance of any symptoms. This view was confirmed by another series with the same soil, in which there was no sign of the disease, even in pots which had a 4 per cent. excess of calcium carbonate and a P_H value of 8·1. That the availability of manganese does not depend on soil reaction alone was borne out by the Netherby and Urrbrae series, where no disease developed although the alkaline limits were P_H 8·3 and 8·6, respectively.

Manurial pot tests showed that nitrogenous dressings increased growth and yield but did not prevent the death of the leaves from grey speck. The severest symptoms were observed in pots treated with nitrate of soda (at the rate of 570 lb. per acre) or with cyanamide (896 lb. per acre), whereas in pots treated with ammonium sulphate (448 lb. per acre) or ammonium chloride (365 lb. per acre) the symptoms were less marked and the yields better than in the untreated controls.

In applications at the rate of 4 lb. per acre, manganese sulphate gave no improvement, but dressings of 10 or 40 lb. per acre increased growth and reduced the specks on the leaves, while a 40 or 75 lb. dressing of permanganate of potash almost completely prevented the disease. Dressings of manganese and ammonium sulphates mixed also gave excellent growth, superior both to that of the untreated controls and to that given by either treatment alone. In pots top-dressed with manganese sulphate two months after sowing, when the disease was already marked, the plants grew away with healthy leaves.

Sterilization of the soil by heating in an autoclave for one hour also effected a complete cure, but sterilization with formalin was ineffective.

Manurial field tests at Mount Gambier showed that grey speck was increased by liming, very slightly controlled by ammonium sulphate or ammonium chloride, and completely prevented by manganese sulphate, which, it is thought, may possibly give the best results if applied as a top dressing when the plants first show the disease.

Water cultures, containing, respectively, no manganese, and 1 in 4,000,000 and 1 in 400,000 parts manganese, were prepared with P_H values from 5·5 to 7·4, the alkaline cultures having an excess of calcium ions. After one month the plants in the solutions not containing manganese became affected with grey speck, and died before reaching the age of 14 weeks, whereas the others remained perfectly healthy, even in the most alkaline solution containing an excess of calcium ions.

Analyses showed that healthy oats contained a much greater proportion of manganese than those suffering from grey speck. Approximately the same amount of manganese was extracted from sterilized and unsterilized Mount Gambier soil by treatments with N/10 nitric acid, but whereas 18 per cent. of the amount obtained from the sterilized soil was dissolved by the first 400 c.c. of the acid, only 5 per cent. was removed from the unsterilized sample under the same conditions. With the Penola soil, all the manganese removable from the sterilized soil appeared in the first 400 c.c. of the acid, the unsterilized sample yielding only half this

amount; slow water percolation removed four times as much manganese from sterilized as from unsterilized Penola soil.

Heat sterilization increased the proportion of calcium ions in the Mount Gambier soil, but cured the disease. There was also little difference between the calcium ions ratio for the healthy Netherby and the diseased Mount Gambier soils. It would appear, therefore, that it is the availability of manganese in the soil and not an excess of calcium ions that causes the disease, and the name manganese deficiency disease is suggested in place of grey speck.

McLennan (E.). **The growth of fungi in soil.**—*Ann. of Appl. Biol.*, xv, 1, pp. 95–109, 1 graph, 1928.

The experiments briefly described in this paper consisted in inoculating previously sterilized soil with a mixture in equal numbers of the spores of *Alternaria humicola, Penicillium lilacinum, Trichoderma koningi*, and *Verticillium (Acrostalagmus) cinnabarinum*, after which the soil was incubated at 9° C. At intervals, representative samples of the incubated soil were plated out by the dilution method, and an analysis was made of the fungal population of the plates. A comparison of the results thus given with the data obtained from the rate of mycelial growth of the same organisms in pure cultures, also maintained at 9° C., showed that the number of fungi occurring in soil calculated by this method bears no relation to their vegetative growth in this substratum; it rather supported Conn's view that this method only measures the sporing capacity of the species used.

Further tests in which samples of the soil prepared as above were plated out by the dilution method, either in a moist condition or after desiccation in a vacuum over calcium chloride, showed a marked decrease in the number of fungal colonies arising from the dried samples. The reduced pressure did not appear to have any effect, since comparable results were obtained with samples dried under ordinary atmospheric pressure. In a third series suspensions in soil and in sand of fragmented mycelia of the fungi, or of a mixture of their spores, were plated out directly or after drying. No colonies developed from the dried suspension of fragmented mycelia, while the sample containing the spores was in no way affected by desiccation. These facts lead the author to believe that the decrease in the number of colonies was due to the desiccation of the vegetative mycelia in the soil, thus indicating that the normal fungal constituents of the soil occur almost exclusively as mycelium.

Severtzova (L. B.). **The food requirement of soil amoebae with reference to their interrelation with soil bacteria and soil fungi.**—*Centralbl. für Bakt.*, Ab. 2, lxxiii, 8–14, pp. 162–179, 6 figs., 1928.

The writer conducted a series of investigations [the technique of which is described] to determine the behaviour of soil amoebae towards soil bacteria, actinomycetes, yeasts, and filamentous fungi. It was found that the amoebae fed readily on *Rhizopus nigricans*, *Citromyces* sp., *Mycoderma* sp., *Cladosporium herbarum*, *Picchia*, sp., and *Willia anomala*; while four species of *Mucor*, *Oidium* sp.,

Aspergillus niger, *A.* sp., *Penicillium* sp., *Torula rubra*, rosa Hefe [a pink yeast], *Actinomyces sulfureus*, and *A.* sp., were rejected. Even in the first group the author was not able to observe that the spores and hyphae of the filamentous fungi tested were actually digested. Evidence that they served as food depends on the fact that the amoebae multiplied more in their presence than in their absence. The amoebae preferred the yeasts (especially *Picchia* sp.) to the bacilli, which in their turn were preferred to the moulds.

DUBOS (R. J.). **Influence of environmental conditions on the activities of cellulose decomposing organisms in the soil.**—*Ecology*, ix, 1, pp. 12–27, 4 graphs, 1928.

The influence of certain environmental factors on cellulose decomposition was studied at the New Jersey Agricultural Station by the following methods: (*a*) direct microscopic examination; (*b*) determination of the numbers of cellulose-decomposing bacteria, actinomycetes, and fungi (*Trichoderma* and *Penicillium* spp. and an unidentified black mould); (*c*) rate of CO_2 evolution; and (*d*) the amount of cellulose decomposed, when cellulose is added to normal or sterile soils inoculated with pure and mixed cultures [*R.A.M.*, vii, p. 115].

The following conclusions were reached. The presence or absence of an abundant supply of combined nitrogen has no appreciable influence on the nature of the organisms concerned in the decomposition of cellulose in the soil. Under acid conditions, fungi are apparently the only organisms to decompose cellulose [ibid., v, p. 763]. The numbers of fungi were found to increase immensely in the acid soils receiving cellulose, the optimum development occurring between 50 and 90 per cent. moisture. In neutral, very slightly acid, and slightly alkaline soils at an optimum moisture (60 to 80 per cent. saturation), bacteria are probably equally active with the fungi, or possibly more so. The actinomycetes were found to thrive only in dry soils (50 per cent. saturation), their slow growth preventing competition with bacteria or fungi in humid soils. In normal soils kept under water, active decomposition of the cellulose does not begin for 14 to 16 days, probably owing to the absence of a proper medium for anaerobiosis.

OLLIVIER (A.). **El Lúpulo. Experiencias realizadas en la Escuela de Agricultura de San Juan.** [The Hop Experiments conducted at the College of Agriculture of San Juan.]—*Min. Agric. Nac. (Buenos Aires) Secc. Prop. e Inform. Circ.* 724, 7 pp., 4 figs., 1928.

It is stated that the only disease of hops observed at the San Juan Agricultural College (Argentine Republic) is mildew (*Sphaerotheca humuli*), which is readily controlled by the application of calcium polysulphide or sulphur.

EDWARDS (W. H.). **Conférence faite à une réunion du 'Former Agricultural Students' Association' tenue au Réduit le 15 Décembre 1927.** [Address given at a meeting of the Former Agricultural Students' Association held at Réduit on

15th December, 1927.]—*Rev. Agric. de l'Île Maurice, 1927*, 36, pp. 341–347, 1927.

The two most important diseases of sugar-cane in Mauritius are stated to be gummosis (*Bacillus* [*Bacterium*] *vascularum*) and red rot [*Colletotrichum falcatum*]. Gummosis, which is showing a marked tendency to spread, chiefly affects the widely cultivated Big White Tanna variety. The symptoms of the disease are described in popular terms, and directions are given for its control by suitable cultural measures, supplemented by immersion of the setts in Bordeaux or Burgundy mixture.

TEMPANY (H. A.). **Address delivered to the Chamber of Agriculture on Wednesday, December 14th, 1927.**—*Rev. Agric. de l'Île Maurice, 1928*, 37, pp. 23–28, 1928.

A warning statement is made regarding the diminution of yield in the Mauritius sugar-cane crop as a result of diseases (chiefly gummosis [*Bacterium vascularum*] and red rot [*Colletotrichum falcatum*]) [see preceding abstract]. In addition to the ordinary form of gummosis, the White Tanna variety (which covers 57 per cent. of the total area under sugar-cane) suffers from what may possibly be another form of this disease. This is termed stem deterioration, and is characterized by the appearance of yellowish-white patches in the interior of the cane. Red rot is most prevalent on the D.K. 74 variety. Tables are annexed showing the prevalence of these two diseases during 1927 on the four principal varieties in eight districts.

Careful selection of cuttings for planting from plants free from these diseases is recommended, and also the introduction into cultivation on a wider scale of new varieties of seedling and other canes, of which a large range have been tested by the Department of Agriculture and are available for the purpose.

LEE (H. A.). **Pathology.**—*Rept. Committee in charge of Exper. Stat. for the year ending September 30th, 1927.—Proc. Forty-seventh Ann. Meeting, Hawaiian Sugar Planters' Assoc., 1927*, pp. 30–41, 1928.

During the winter of 1926–7, 4,300 acres of H. 109 sugar-cane in Hawaii became affected with eye spot [*Helminthosporium sacchari*: *R.A.M.*, vii, p. 199]; this was approximately 8·8 per cent. of the total H. 109 acreage, and the loss caused was estimated at 5,000 tons of sugar. The toxin produced by *H. sacchari* was separated out and found to be, apparently, an inorganic nitrite. As in the previous year, the new varieties P.O.J. 36, 213, 234, and 979 proved highly resistant to eye spot; P.O.J. 2714, 2725, and 2727 were slightly less so; and E.K. 28, Natal Uba, and Porto Rico Uba were also resistant. B.H. 10 (12) was much less susceptible than H. 109.

Little or no commercial loss was sustained from the condition associated with a species of *Pythium*, and formerly known as Lahaina disease [ibid., vii, p. 346], but the correlation previously observed between its occurrence and a neutral or alkaline soil reaction no longer holds, as the disease has since been found on

acid soils in the Hilo and Hamakua districts of Hawaii. The principal factor in this type of growth failure is thought to be the rotting of the root tips and stele caused by the *Pythium*.

Mosaic was more prevalent than usual, as a result of a drought in 1926; the planting of the resistant D. 1135 is therefore being extended. P.O.J. 36, 213, 234, and 979 also proved very resistant to mosaic, while some planters are adopting (unwisely, in the author's opinion), the very tolerant U.D.1., Kohala 202, and B.H. 10 (12) canes. It is stated that the resistance shown by such varieties as D. 1135, Yellow Caledonia, and H. 109 is largely mechanical, a layer of stone cells protecting the leaf from punctures by the vector, *Aphis maidis.*

Red stripe disease [*Phytomonas rubrilineans*: ibid., vii, p. 59] was observed for the first time in Kauai island, and in the Hamakua and Hilo districts of Hawaii island. Kohala 115, 117, 107, 73, and 202 are commercially resistant, as are all the standard canes grown in the Territory, where Badila (which is cited as susceptible in Australia to a very similar and possibly identical disease) [ibid., v, p. 696] is also lightly attacked.

Hawaii. Sugar planters working on root rot of Lahaina Cane. —*Planter and Sugar Manufacturer*, lxxx, 2, p. 35, 1928.

Eight-months-old Lahaina sugar-cane planted near H. 109 at Kailua, Oahu [Hawaiian Islands], in mid-winter, on an abandoned rice patch and before adequate drainage could be arranged, had a perfect root system, although subjected to heavy rains for about five months. A few hundred feet away, younger Lahaina cane showed several stools quite stunted owing to root rot, *Pythium* being abundantly present on these roots.

The success of the Lahaina cane at Kailua is considered by C. W. Carpenter to substantiate the view that the failure of this variety in Hawaii was due to the *Pythium* fungus [*R.A.M.*, vi, p. 187; vii, p. 346], and not to the soil conditions in themselves. The soil conditions to which root rot of sugar-cane is attributed in Java also exist at Kailua, but in the absence of *Pythium* there appears to be no root rot. The Lahaina failure is attributed by Carpenter to a specific fungous disease and should not be confused with the localized growth failure of standard varieties.

Craig (N.). **L'acidité des sols et la pourriture de la racine de la Canne à Sucre.** [Soil acidity and root rot of sugar cane.]—*Rev. Agric. de l'Île Maurice, 1927*, 36, pp. 336–338, 1927.

Root rot of sugar-cane has been attributed to the presence of soluble aluminium salts in acid soils [*R.A.M.*, v, p. 326 *et passim*]. The hydrogen-ion concentration of a number of Mauritius soils has been found to range from P_H 4·8 to 8·7. The soils producing sound canes average higher in hydrogen-ion concentration than those yielding diseased ones, indicating that some other factor is responsible for the prevalence of the disease on the island.

Bokma De Boer (B.). **Repliek op het naschrift 'De bibitbehandeling en bibitvoorziening ten behoeve der aanplanting van Suikerondernemingen'.** [Reply to the postscript: 'The

treatment and supply of setts for the planting of Sugar estates'.]—*Arch. Suikerind. Nederl.-Indië,* I Deel, xxxvi, 4, pp. 77–83, 1928.

This is a further contribution to the discussion of the problem of the degeneration which the author believes is taking place in certain varieties of Java sugar-cane [*R.A.M.*, vii, p. 271].

VENKATRAMAN (T. S.) & THOMAS (R.). **A leaf adaptation conducive to mosaic resistance in the Sugar-cane.**—*Agric. Journ. of India*, xxiii, 1, pp. 56–57, 2 figs., 1928.

The immunity of the Kassoer variety of sugar-cane from mosaic disease is attributed to the existence of the same character in one of its parents, 'glagah' [*Saccharum spontaneum*: *R.A.M.*, v, p. 697]. The leaves of Kassoer, like those of its immune parent, have on the surface sharp, stiff, unicellular bristles which protect the stomata and surrounding regions from insect invasion. On the other hand, a number of broad- and soft-leaved, susceptible varieties, e.g., Poovan, Co. 1, Red and Purple Mauritius, Java (Hebbal), and Vellai, are without this arrangement. The wild grass *S. narenga* is also devoid of bristles on the leaves.

RYAN (RUTH). **Asterina spp. from India.**—*Mem. Dept. Agric. India*, Bot. Ser., xv, 5, pp. 103–105, 1928.

English diagnoses are given of several new species of *Asterina* and one *Morenoella*, mostly on trees, from the Pusa herbarium collected in various parts of India between 1911 and 1919. Two previously known species of *Asterinella* are also included.

STEVENS (F. L.). **Meliola spp. from India and one from Malay.**—*Mem. Dept. Agric. India*, Bot. Ser., xv, 5, pp. 107–111, 3 pl., 1928.

English diagnoses are given of four new species of *Meliola* from the Pusa herbarium, collected between 1903 and 1919, of which *M. theacearum* on *Schima*, Penang, is regarded as of special interest as the only true *Meliola* hitherto recorded on any member of the Theaceae. In addition, six other species are recorded and notes are given on five undetermined forms which were heavily parasitized by fungi of the genera *Spegazzinia*, *Helminthosporium*, and *Arthrobotryum*.

BROWN (W.). **Studies in the genus Fusarium. VI. General description of strains, together with a discussion of the principles at present adopted in the classification of Fusarium.**—*Ann. of Botany*, xlii, 165, pp. 285–304, 1928.

The author made a comparative study of about forty strains of *Fusarium*, most of which arose as saltants in culture from six isolations from apple fruit [originally referred to as *F. blackmani*: *R.A.M.*, iii, p. 558; iv, p. 421]. These strains may be divided into four groups on the ground of their cultural characteristics on a standard synthetic medium (the composition of which is given). It is pointed out that this morphological classification agrees with the varying parasitic power of the strains, their pathogenicity to apples

being correlated with the tendency to produce a mycelial type of growth. Since a number of the saltant strains, though derived from different parent strains, are indistinguishable from one another, it is considered that all the strains investigated are varieties of a single species, which has been identified by Wollenweber as *F. fructigenum*, the name *F. blackmani* being withdrawn. There was also evidence, based on the occurrence of saltations in cultures of *F. salicis*, originally obtained from Wollenweber, to show that this species cannot be separated from [the earlier named] *F. fructigenum*, so that one of these specific names should be dropped. In view of the apparently frequent occurrence of saltations in the genus *Fusarium*, the author considers that the present system of classification of these fungi should be revised, and that such a revision would in all probability lead to a considerable reduction in the number of species now recognized.

EDWARDS (W. H.). **Les maladies du Tabac.** [Tobacco diseases.]—*Rev. Agric. de l'Île Maurice, 1927*, 36, pp. 339–341, 1927.

A brief, popular account is given of the symptoms of tobacco mosaic, two types of which are distinguished in Mauritius [*R.A.M.*, vii, p. 276], with observations on recent studies of the disease and directions for its control.

HOPKINS (J. C. F.). **Mosaic disease of Tobacco.**—*Rhodesia Agric. Journ.*, xxv, 2, pp. 188–194, 2 figs., 1928.

This paper gives a popular account of the nature, symptoms, and mode of dissemination of tobacco mosaic, and states that the disease is very prevalent in Rhodesia, though the injury caused by it is often regarded as of minor importance. Nevertheless, severe infection may reduce the weight of a crop by 10 to 25 per cent.

A thick, crinkled condition of the leaves of tobacco plants is commonly confused in Rhodesia with frenching [*R.A.M.*, vi, p. 132], but the evidence obtained suggests that the affection is due to an abnormal condition of the root system, or to insect attack.

In the author's opinion the main source of mosaic infection lies in volunteer plants and suckers from a previous tobacco crop allowed to remain in neighbouring fields. There is reason to believe that, in the majority of cases, mosaic first appears in the seed-beds.

Pending further investigation it is recommended that seed from mosaic plants should not be used, since the evidence regarding seed transmission is conflicting. If the disease appears in a few isolated places in the seed-beds, the affected plants, together with a rather wide border of healthy plants, should be removed and destroyed, or preferably, be drenched with 1 to 25 formalin solution to kill them. Bordeaux mixture containing lead arsenate (3 oz. to 4 galls.) may be applied regularly to keep down the insect vectors.

If infection is severe, either in the seed-beds or the field, destruction of the plants is not likely to be economically advisable. Control in the field consists chiefly in avoiding dissemination by contact. If the infection does not exceed 1 or 2 per cent. the diseased plants should be removed in bags and burnt; plants should not be left to dry out near the field, and labourers should not handle healthy and

diseased plants on the same day. Scorched leaves [ibid., vi, p. 583], if primed off, should be destroyed.

HOLMES (F. O.). **Accuracy in comparing various concentrations of Tobacco-mosaic virus.**—Abs. in *Phytopath.*, xviii, 1, p. 132, 1928.

A method is described of carrying the tobacco mosaic virus from expressed juice or diseased plants to small healthy plants by single inoculations with fine No. 00 black enamel insect pins, so that minute quantities of juice are transferred, and transmission is secured regularly enough to permit quantitative studies. Uniform wounding and the depositing in the wounds of a large proportion of the virus transferred on the pins are requisite for uniform readings. To adjust the dose several pins may be mounted on one handle and used simultaneously. The method is so accurate that test dilutions of 1 : 4 or 1 : 8 can be identified from undiluted samples of virus with a certainty corresponding to odds of 22 to 1 or more.

VALLEAU (W. D.) & JOHNSON (E. M.). **Experiments and observations on the control of true Tobacco mosaic.**—Abs. in *Phytopath.*, xviii, 1, pp. 132, 1928.

In a rotation series in which 13,000 tobacco plants are set each year, mosaic counts, made about three weeks after setting for three consecutive years, showed 9, 6, and 8·7 per cent. mosaic, respectively, when the plants were pulled by men chewing natural leaf tobacco [cf. *R.A.M.*, vi, p. 515]. The following year, when commercial tobacco was largely used for chewing, the mosaic percentage was 2·1, and in the two subsequent years, when sterilized tobacco was chewed, the figures were 0·44 and 0·05 per cent., respectively. In 1927, when the men's hands were washed prior to pulling, 32 cases of mosaic developed among 71,183 plants. Of 134 plants pulled by a man who chewed infective natural leaf tobacco and occasionally spat on his hands during the work, 108 developed mosaic, while 156 plants pulled with clean hands were healthy 47 days after setting. When no effort was made to contaminate the worker's fingers, 39 cases of mosaic developed among 878 plants. There was only one case of mosaic in 48 days among 837 plants pulled with clean hands and set in alternate rows.

VALLEAU (W. D.) & JOHNSON (E. M.). **Some virus diseases of Tobacco in Kentucky.**—Abs. in *Phytopath.*, xviii, 1, pp. 132–133, 1928.

Four apparently distinct strains of true tobacco mosaic, differing in severity, have been obtained from tobacco in Kentucky. Other virus diseases of tobacco, distinct from mosaic and common near Lexington, include ring spot [*R.A.M.*, vii, p. 408, and next abstract], which has been transferred from naturally infected tobacco, bull nettle [*Solanum carolinense*], and cucumbers to tobacco, but not from ring-spotted delphinium and peony; 'coarse-etched', a disease somewhat resembling ring spot; 'puffed', which has been transferred from naturally infected tobacco, cucumber, muskmelon, and milkweed [*Asclepias syriaca*] to tobacco and is possibly identical with cucumber mosaic [ibid., v, p. 142]; 'etched', characterized by

chlorotic dots in the growing point and a fine etched necrotic pattern on some of the leaves; 'etched +', evidently a severe strain of the foregoing; and 'vein-margin', possibly a very mild strain of etched, which causes slight spotting in the growing point and a general mild chlorosis of some of the older leaves, except in the tissue immediately adjoining the veins. These diseases are less prevalent than tobacco mosaic but equally injurious and spread quite as rapidly by natural means.

WINGARD (S. A.) & FROMME (F. D.). **Tobacco ringspot; a virus disease with a wide host range.**—Abs. in *Phytopath.*, xviii, 1, p. 133, 1928.

Further studies of tobacco ring spot [see preceding abstract] have shown it to be a virus disease capable of infecting a wide range of plants. Infection has been obtained on 19 genera of plants representing the following 11 families: Solanaceae, Compositae, Leguminosae, Phytolaccaceae, Violaceae, Amaranthaceae, Chenopodiaceae, Polygonaceae, Convolvulaceae, Plantaginaceae, and Aizoaceae. There is some evidence that the green aphis may transmit the virus in the greenhouse, but insects are not necessary for infection, which is readily accomplished by swabbing healthy plants with the expressed sap of diseased individuals. The sap has been found infectious in dilutions up to 1 in 10,000.

HOPKINS (J. C. F.). **Wildfire and angular spot of Tobacco.**—*Rhodesia Agric. Journ.*, xxv, 2, pp. 139–143, 3 pl., 1928.

Continuing his account of tobacco diseases of Rhodesia [*R.A.M.*, vii, p. 203, and above, p. 476], the author gives a popular description of wildfire [*Bacterium tabacum*] and angular spot [*Bact. angulatum*], and recommends the usual control methods [ibid., vi, p. 324]. Should wet weather cause either disease to reappear after the plants have been thoroughly primed, a second priming should be effected, just before a dry spell, if this can be predicted. After the removal of the six or eight bottom leaves, plants usually produce good heavy leaves above, while the increased aeration much reduces white mould [*Erysiphe cichoracearum*].

SHAPOVALOV (M.). **Yellows, a serious disease of Tomatoes.**—*U.S. Dept. of Agric. Misc. Publ.* 13, 4 pp., 1 fig., 1928.

In this paper the author dwells at some length on the advantages of substituting the name 'tomato yellows' for 'western yellow tomato blight' in dealing with the virus disease of tomatoes which has been definitely shown to be related to the curly top of sugar beet and to be carried from plant to plant by the leafhopper [*Eutettix tenella*; *R.A.M.*, vii, p. 282]. It is pointed out that the adjective 'western' in connexion with this disease is misleading, since subsequent observations have established that it occurs as far east in the United States as Iowa and it may be discovered elsewhere. The new name would also avoid a confusion with other blights due to various causes, and for this reason plant pathologists of the western United States, at their recent meeting at Reno, Nevada, have approved the change.

It is further stated that investigations are in hand in different

parts of the United States on different phases of the problem of controlling the disease, and that consistent results are already being obtained by shading the tomato plants with cloth tents or by interplanting a tall and fast-growing crop such as the sunflower. In the experiments of the last two years the percentage of yellows was reduced by these means to less than 0·5 per cent. of that in the adjoining control rows. There are also consistent indications of the presence of resistance in certain varieties, such as some dwarf types, though the degree of natural resistance so far observed is very slight and is of no commercial significance.

STOVER (W. G.). **Experiments with Tomato streak.**—Abs. in *Phytopath.*, xviii, 1, p. 154, 1928.

Streak [*R.A.M.*, vii, p. 301] has been induced by the inoculation of tomato plants with extract from mosaic tomato, together with that of potato plants suffering from mild or rugose mosaic, leaf roll, or spindle tuber, and in some cases with that from apparently healthy plants. The disease was also induced by inoculating tomatoes with juice from mosaic tomatoes and from either tomato or black nightshade [*Solanum nigrum*] previously inoculated with potato mosaic. Streak is transmissible from streak-infected tomato through either tobacco or black nightshade back to tomato. Infection also developed in tomato plants inoculated from either tobacco or black nightshade that had received a previous double inoculation with tomato mosaic and potato rugose mosaic. The streak virus mixture may occur in any part of the diseased plant or be absent from certain organs. The potato element becomes non-infective soon after the death of the affected tissue, while the tomato element may remain infective for some time.

RICE (W. H.). **Control of Tomato mildew. Trials in Auckland district, season 1927–28.**—*New Zealand Journ. of Agric.*, xxxvi, 2, pp. 99–102, 1928.

Tomato mildew [mould] caused by *Cladosporium fulvum* [*R.A.M.*, iv, p. 69; v, p. 257] is stated to be very prevalent on tomatoes under glass throughout the Auckland district of New Zealand. The 1927–8 season was particularly bad for the disease, owing to the continual wet and overcast weather which prevented good ventilation of the houses and promoted a tender growth of the plants. High day and low night temperatures at the period when the fruits were swelling and ripening caused the disease rapidly to kill the tender plants, even though the latter were well forward in their development.

The results of experiments and observations made during the season indicated that the severe incidence of the disease in the Auckland district is mainly due to the poor ventilation of the majority of the glasshouses. It was observed that the better the ventilation was and the more freely it was used during the growing period, the better the plants resisted infection. Dusting the plants with flowers of sulphur, sulpho, or 'cloud form' tomato dust did not give any degree of control. The application of White Island No. 1 mineral product prior to planting, at the rate of 300 lb. per acre, with repeated surface dressings after each watering or hoeing,

at the rate of 100 lb. per acre, appeared to control soil insects and resulted in the development of more robust plants exhibiting considerable resistance. Complete fertilizers are advisable when the land is prepared for planting, together with nitrogen in a form not immediately available, but superphosphate in excess appeared to predispose the plants to attack by *C. fulvum*. Top vegetation should be encouraged after stopping the plants, so as to provide foliage to carry them through the disease. Dry atmospheric conditions should be maintained in the houses during the winter, most of the water required being applied before planting.

Part VII. Diseases of plants.—Vegetable and animal pests noxious to agriculture.—*Internat. Yearbook of Agric. Legislation, XVIth Year, 1926* (English Ed., 4th Year), pp. 315–327, 1927. [Received May, 1928.]

This section of the year-book of international legislation comprises the various decrees and orders enacted against plant diseases and insect pests in different countries during 1926 [*R.A.M.*, vi, p. 703].

Plakat av 23 desember 1927 om foranstaltninger til bekjempelse av Potetkreft (Synchytrium endobioticum). [Decree of 23rd December, 1927, concerning the regulations for the control of wart disease of Potatoes (*Synchytrium endobioticum*).]—2 pp., Grøndahl & Søn, Oslo, 1928.

This Decree, which supersedes those of 8th September,1916, and 20th May, 1921, defines the regulations (coming into force on the the date of issue) for the control of wart disease of potatoes (*Synchytrium endobioticum*) in Norway [*R.A.M.*, vi, p. 181]. Potato crops which are found, on inspection by duly qualified and authorized State officials, to be infected by wart disease, must immediately be burnt or buried with unslaked lime, and bins, implements, &c., disinfected with 2 per cent. formalin if required. No potatoes, manure, refuse, and the like may be removed from the quarantined area without the sanction of the Ministry of Agriculture. The above regulations also apply to the so-called 'zones of infection' within the quarantined area, while in addition no root crops or plants with the roots adhering may be exported from these zones. For the first two years after the detection of wart disease, the cultivation of potatoes is prohibited within the zone of infection; thereafter only officially recognized immune varieties may be planted. Within the so-called 'safety zone' the exclusive cultivation of immune varieties may be ordered at the discretion of the Ministry.

White Pine blister rust quarantine amended.—*Amer. Forests*, xxxiv, 412, p. 244, 1928.

In view of the discovery of white pine blister rust [*Cronartium ribicola*] on currant and gooseberry leaves at more than twenty points in Oregon and eastern Washington, and at one point in northern Idaho, an amendment to Federal Quarantine No. 63, effective as from 1st March, 1928, adds Idaho and four counties in Oregon to the territory designated as infected [*R.A.M.*, vi, p. 64].

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

APPLIED MYCOLOGY

Vol. VII AUGUST 1928

Doolittle (S. P.). **Soil transmission of Tomato mosaic and streak in the greenhouse.**—Abs. in *Phytopath.*, xviii, 1, p. 155, 1928.

The viruses of both tomato mosaic and streak [*R.A.M.*, vii, p. 479] were found in 1927 to live at least 70 days in greenhouse soils. Plants grown in sterilized soil were transplanted under closed cheesecloth cages in a house where both diseases were prevalent, and infection occurred in all the trials made to date, while control plants on mosaic-free soils remained healthy. The tomato mosaic virus has been found to live four to six weeks in field soils, but hitherto there has been no evidence of the overwintering of the virus where the plants are protected by cages. Preliminary studies indicate that the tomato streak produced by a mixed infection with the tobacco mosaic virus and either mosaic or healthy potato juices is not identical with much of the streak occurring in the field and greenhouse.

Hahn (G. G.). **Fungi as an international problem.**—*Trans. & Proc. Bot. Soc. Edinburgh*, xxix, 4, pp. 342–348, 1927.

This paper, in which the author discusses the international aspect of fungous diseases, with special reference to the introduction of tree diseases into the United States from abroad, includes, amongst others, the following items of phytopathological interest.

All American and European chestnuts succumb to blight (*Endothia parasitica*), which has practically exterminated the native *Castanea dentata* in large areas of the United States. The hairy Chinese chestnut (*C. mollissima*) and the Japanese chestnut (*C. japonica*) are resistant both in their natural habitat and under controlled conditions in America, and since direct control of the disease is impossible the only hope is the development of some disease-resistant stock suitable for forest purposes.

Blister rust (*Cronartium ribicola*) readily attacks all five-needle pines except the Himalayan pine (*Pinus excelsa*), the Balkan pine (*P. peuce*), and the Alpine form of *P. cembra*, which are more or less resistant.

The so-called Woodgate rust [*Peridermium* sp.: *R.A.M.*, vi, p. 195], discovered in the State of New York in 1925, bears no specific resemblance to any rust known in other parts of the world

so that its source of origin is obscure, but it is thought to be probably an introduced species. It occurs only on Scotch pine (*P. sylvestris*) but the possibility of its spread to other species must not be overlooked. It appears to be quite distinct from the bladder rust (*P. pini*) found on the same host in the British Isles.

Phomopsis pseudotsugae, to which the *Phomopsis* disease of the Douglas fir (*Pseudotsuga douglasii*) has been attributed, probably belongs to the Old World and so far as is known is not present in the United States. As the Douglas fir constitutes a quarter of all the standing timber in the States the potential danger from this fungus, if introduced, is obvious.

In the author's opinion a comprehensive system of quarantine is the only safeguard against foreign plant diseases.

TUBEUF [C. v.]. **Reichspflanzenschutzgesetz.** [A State plant protection law.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxviii, 3–4, pp. 65–70, 1928.

In order to prevent the further introduction into Germany of such serious fungous diseases as white pine blister rust [*Cronartium ribicola*], needle fall of Douglas fir [*Rhabdocline pseudotsugae*], chestnut blight [*Endothia parasitica*], and gooseberry mildew [*Sphaerotheca mors-uvae*], the writer envisages the adoption of far-reaching legislative measures. These should embrace the entire German Republic and should be directed, first and foremost, to the exclusion of all plants with roots, the clumps of soil adhering to which are liable to contain fungous spores, while the packing material is also frequently infected. Cultivated plants of every kind should be imported solely in the form of seed, which can, if necessary, be disinfected before use.

TUBEUF [C. v.]. **Das Schicksal der Strobe in Europa.** [The fate of the Weymouth Pine in Europe.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxviii, 1–2, pp. 1–32, 19 figs., 1928.

This is a more detailed account of the white pine blister rust (*Cronartium ribicola*) situation in Europe (especially Germany) and America than that already noticed [*R.A.M.*, vi, p. 522]. The history of the disease is fully described and particulars are given concerning its distribution and ravages in Germany. In conclusion the author recapitulates his appeal for the replacement of the susceptible *Pinus strobus* and *P. monticola* by the resistant *P. peuce*, and proposes a number of other measures for the improvement of the situation. *Armillaria mellea* is also described and figured.

Douglas Fir leaf-cast disease.—*Forestry Comm. Leaflet* 18, 2 pp., 2 figs., 1927.

This leaflet gives a brief account of the disease of Douglas firs in Great Britain caused by *Rhabdocline pseudotsugae*, based on information which has already been noticed [*R.A.M.*, vi, p. 763].

TUBEUF [C. v.]. **Eine neue Krankheit der Douglastanne.** [A new disease of the Douglas Fir.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxviii, 3–4, pp. 70–78, 4 figs., 1928.

After a brief note on the silvicultural requirements of the Douglas

fir and on the fungi attacking it under various conditions, the writer draws attention to the recent development in Scotland of the needle fall disease due to *Rhabdocline pseudotsugae* [see preceding abstract]. The main features of the disease are summarized, and the immediate adoption of legislation is proposed to prohibit the importation into Germany of living plants and cut branches of Douglas firs. Investigations should also be instituted in forest nurseries to ascertain whether the disease is already present in the country.

GAISBERG (ELISABETH v.). **Studien über den Lärchenkrebspilz, Dasyscypha willkommii, insbesondere über die Keimung seiner Sporen.** [Studies on the Larch canker fungus, *Dasyscypha willkommii*, with special reference to the germination of its spores.]—*Centralbl. für Bakt.*, Ab. 2, lxxiii, 8–14, pp. 206–233, 1928.

The writer carried out a series of microscopical observations and laboratory experiments [which are fully described] on the larch canker fungus (*Dasyscypha willkommii*) [*R.A.M.*, vii, p. 209] at the Tübingen (Württemberg) Botanical Institute.

Apothecial development was found to depend exclusively on the presence of sufficient moisture, and ascospore discharge occurred profusely on filter paper in Petri dishes. The apothecia were equally active in discharging ascospores in light and darkness and were unaffected by temperature relations, the intensity of ascospore discharge being identical on ice and at 28° C. The apothecia survive freezing for several hours, and the ascospores were resistant to desiccation for periods up to eight months before germination, and for a few days after. Germination was impeded in alkaline solutions but occurred readily on the addition of acid. Exposure to direct sunlight of several hours' duration produced an injurious effect on the spores. The optimum temperature for germination under the conditions of these experiments was 15° to 22° and the maximum 31°. Germination took place in freshly expressed cortical extract of larch, fir, and pine. The conidial stage developed readily on artificial media.

HEY. **Das Eichensterben in Westfalen.** [The dying-off of Oaks in Westphalia.]—*Zeitschr. für Forst- und Jagdwesen*, lx, 1, pp. 49–50, 1928.

In spite of the ravages of the green oak leaf-roller [*Tortrix viridana*], accompanied by mildew [*Microsphaera quercina*: *R.A.M.*, vii, p. 126], the state of the oak stands in Westphalia showed a marked improvement during 1927. The writer thinks that a climax in the epidemic of dying-off has been reached, and that a return to normal conditions may be anticipated.

VANINE (S. I.). **Гниль дерева, ее причины и меры борьбы.** [Wood rot, its causes and control.]—112 pp., 45 figs. Issued by the Leningrad Institute of Forestry, Leningrad, 1928.

This small text-book gives a very comprehensive though concise account of the most important rots of living forest trees and of timber both in timber yards and in buildings, with particular reference to those that occur in European and Asiatic Russia. A separate

chapter is devoted to the description of the macroscopical aspect of the various rots and of the damage done by them to wood, and a table is appended allowing of a rapid diagnosis of the rots of living trees. The morphology of the various species of fungi involved in the rots is described, the species being grouped under two main headings, namely, those causing rots of living trees, and those that lead to the decay of stacked and constructional timber. Control measures are briefly discussed, especially those used for the prevention of rot and mould staining of timber. Many of the figures in the book are original, and the bibliography appended comprises 77 titles.

CURTIN (L. P.) & THORDARSON (W.). **Experiments in wood preservation. VI. Recent laboratory work.**—*Indus. & Engin. Chem.*, xx, 1, pp. 28–30, 1928.

Some additional data are presented on the toxicity of various inorganic substances towards *Fomes annosus* [*R.A.M.*, vii, p. 294]. The lowest concentrations completely inhibiting growth, calculating the percentage by weight, were as follows: 2, 4-dinitrophenol 0·008 per cent.; orthoboric acid 0·15; copper sulphate pentahydrate 0·15; copper fluoride 0·08; copper fluoride powder 0·097; copper ortho-arsenite (Scheele's green) 0·04; copper aceto-arsenite (Paris green) powder 0·04; mercuric chloride 0·015; sodium monohydrogen arsenite 0·025; and arsenious oxide 0·015.

The production of acid by twelve other wood-rotting fungi of economic importance was determined by means of sodium alizarin sulphonate and methyl orange indicators. All the fungi evolved sufficient acid to give a reaction with sodium alizarin sulphonate, indicating a hydrogen-ion concentration of at least about P_H 5. *Stereum subpileatum* and *Poria subacida* showed faintly acid to methyl orange, corresponding to P_H 4. *P. incrassata*, *Polyporus betulinus*, *Coniophora cerebella*, *Merulius lacrymans*, and *Daedalea quercina* gave a strong acid reaction with methyl orange, denoting a hydrogen-ion concentration of about P_H 3. *M. lacrymans* apparently produced the most acid, turning the methyl orange cultures red to a distance of 10 mm. beyond the visible growth of the fungus. *C. cerebella* first turned the methyl orange red and then destroyed the colour, the culture appearing during the process as a white disk surrounded by a red rim about 1 cm. across, which in turn was bordered by a wider orange-yellow band.

Zinc meta-arsenite has been found to be the most promising of all the preservative materials tested so far by the authors and their colleagues [loc. cit.]. It does not corrode iron, like the arsenites of copper, and may be used in standard pressure-treating apparatus. As compared with water-soluble preparations, zinc meta-arsenite has been shown not to increase the electrical conductivity of wood, or to leach out on exposure to the action of the weather. These are important properties in connexion with its use on railways and in telegraphic and telephonic supports. Wood containing arsenites of zinc and copper has remained free from insect and fungous attacks in the drastic field tests conducted by the Western Union Telegraph Company during the last 2½ years. The results of experiments [which are tabulated] show that the growth of all the above-

mentioned fungi was practically inhibited by powdered zinc meta-arsenite at 0·10 per cent., the dry rot organisms that give a strong acid reaction as indicated by methyl orange being very sensitive to it. Further tests showed that wood containing zinc meta-arsenite possessed a high degree of resistance to all the fungi used in the tests after ten months' exposure to outdoor conditions. The treated wood not only remained unaffected itself, but was able to prevent fungous growth in the non-toxic nutrient gel with which it was mixed during the course of these tests.

DIXON (C. E.). **Prevention of sap-stain in White Pine.**—*New Zealand Journ. of Agric.*, xxxvi, 2, pp. 118–124; 3, pp. 194–200, 9 figs., 1928.

Some details are given of a series of experiments conducted by the New Zealand State Forest Service with the object of finding a suitable treatment for the control of the sap stain which occurs during seasoning in the sapwood of the New Zealand white pine (*Podocarpus dacrydioides*) and which is partly due to the action of various fungi, mainly of species of *Penicillium* and *Cladosporium*. Since the results showed that, once established, sap stain cannot be cured, but that its appearance may be considerably retarded and almost prevented by adequate treatment, it is recommended to dip the sapwood immediately it is sawn into a 2 per cent. solution of borax in water at normal temperature, and to stack it in the open-filleted box type of pile. In this the pile is made up in the form of a box, with no projecting boards, and each layer is separated from those above and below by narrow fillets. The fillets should be not less than 2 in. wide by 1 in. thick, and should be spaced not more than 4 ft. apart, while a 6 in. air chimney should be provided at intervals of 2 ft. in the width of the stack. The pile should be roofed over, the roof overhanging the stack by at least 1 ft. It is pointed out that dipping the boards in the borax solution alone, or the open stacking alone, is not sufficient to prevent the trouble, and that both must be used. Under local conditions, the cost of the treatment is estimated at 2*d*. to 3*d*. per 100 ft. B.M., depending on the methods of carrying out the operation.

Preserving fence-posts with creosote.—*New Zealand Journ. of Agric.*, xxxvi, 1, p. 36, 1928.

This article gives an immersion time-schedule [extracted from New Zealand State Forest Service Leaflet No. 5] for the creosoting of fencing posts of different woods by the open tank process as a preservative against decay [*R.A.M.*, iv, p. 579; vi, p. 646].

PAINE (S. G.) & NIRULA (R. L.). **Studies in bacteriosis. XV. A disease of Swedes and Turnips.**—*Ann. of Appl. Biol.*, xv, 1, pp. 46–56, 2 pl., 1928.

A brief account is given of a diseased condition of swedes which of recent years has been reported from several districts of Great Britain. No symptoms appear to be noticeable in the aerial parts of the plants in the fields, but, on lifting, a large number of roots in affected areas are found in an advanced state of decay, the greater part of their flesh being reduced to a slimy, pink, and evil-

smelling mass. In a less advanced stage, the roots show blackened areas and cavities strongly suggestive of black rot (*Pseudomonas campestris*), but also contain patches of pinkish brown tissue without the characteristic speckling of the vascular bundles which is associated with the latter disease.

Isolations from the diseased tissues yielded a bacterium which was shown by cultural comparison to be identical with the organism isolated from cauliflower in France by Dufrénoy and Szymanek [*R.A.M.*, vi, p. 330], and the pathogenicity of which to swedes and turnips was proved in artificial inoculation experiments. A careful comparison of the morphological and cultural characters of this organism with *P. campestris* showed that the chief differences between the two consist in the colour and contour of the colonies on agar, the rate of liquefaction of gelatine, and the rate of growth on all media. As these differences, in spite of their apparent importance, are of the same order as certain differences found by Nirula in saltants which occasionally arise in laboratory cultures of bacteria, the authors hesitate to recognize their organism as a different species from *P. campestris*, and incline to the view that some sort of saltation has occurred in nature, and that the two are biological strains, either having arisen from the other or both having sprung from some common parent.

OVERPECK (J. C.). **Seed production from Sugar Beets overwintered in the field.**—*U.S. Dept. of Agric. Circ.* 20, 8 pp., 3 figs., 1928.

Experiments conducted during 1923–7 in the Rio Grande valley of southern New Mexico showed that, although all attempts to grow sugar beets from spring plantings (February or March) on a commercial scale failed completely owing to the development of nearly 100 per cent. infection with curly top transmitted by *Eutettix tenella* (whose native food plants are desert plants which harbour the virus) [*R.A.M.*, vii, p. 136], nevertheless, the disease was almost entirely avoided when the planting was done in the late summer and autumn. The plants from these late sowings did not develop sufficiently to be suitable for sugar production, but after overwintering in the field produced seed stalks in the following spring and gave a heavy yield of seed. This obviates the expenses otherwise involved in harvesting, storing, and resetting the stecklings for seed purposes, and may result in the development of a beet seed supply industry in southern New Mexico.

STOREY (H. H.) & BOTTOMLEY (A[VERIL] M.). **The rosette disease of Peanuts (Arachis hypogea L.).**—*Ann. of Appl. Biol.*, xv, 1, pp. 26–45, 4 pl., 2 graphs, 1928.

The rosette disease of groundnuts [*R.A.M.*, vii, p. 15] is stated to have a wide distribution throughout the groundnut growing areas of the Union of South Africa, where it was first recorded in 1909 and has since become of considerable economic importance. A similar, if not identical disease of the crop has also been reported from tropical Africa, Java [ibid., vii, p. 380], and in correspondence from India.

In the field the symptoms of rosette are a severe stunting of the

whole plant and a more or less definite chlorotic condition of the leaves, especially of the youngest, which exhibit a faint mottling; the next leaves to open are predominantly of a pale yellow colour upon which the veins form a dark green network, while subsequent leaves bear progressively smaller pinnae and often are of a uniform yellow colour (without dark veins), curled, and distorted. A few days after unfolding, the yellow leaves usually begin to turn green and eventually they reach a condition only slightly paler than normal, this change occurring at all temperatures observed. In some plants, the leaves may exhibit a characteristic and pronounced mosaic pattern, this condition being usually accompanied by less severe stunting of the plant; it is believed to be due to an exceptional reaction of individual plants to infection by the same virus as that causing typical rosette. Rosetted plants may flower, but do not bear seed. The only yield from diseased plants is the seed that had formed before infection, and where infection occurs early in the plant's growth, the crop is a total failure.

Experiments to determine the transmission of the disease indicated that it is not seed-borne and that it is not carried in the soil. It was successfully transmitted to healthy plants by grafting, but not by inoculations with juice from diseased plants. Further experiments definitely established that the disease is transmitted by *Aphis leguminosae* [ibid., iv, p. 648], which was shown to obtain the virus by feeding on diseased plants. Thirteen species of leafhoppers failed to transmit the disease in a limited series of tests.

In the field, rosette is believed to overwinter in diseased plants that come up in late autumn and survive through the winter, and upon which the aphids were occasionally found to spend the winter. The indications are that in the spring winged adults become disseminated from the overwintering, diseased plants, and cause localized infections from which epidemic spread of the disease frequently occurs later in the season. There is evidence to show that spring infections are most severe in seasons following winters with exceptionally heavy rainfall, which favours the survival of overwintering groundnut plants. It appears likely, therefore, that the number of new infections in early crops may be reduced by all measures tending to the elimination of volunteer groundnut plants during the winter and in the spring before sowing, and by roguing infected plants in the fields as soon as they show the first symptoms, care being taken to prevent the escape of the aphids parasitizing such plants. It is also thought likely that the effects of rosette may be largely minimized by sowing the crop at the earliest favourable date. The best prospect of a practical control of the disease, however, is believed to lie in the discovery of resistant varieties of groundnuts, although so far none of the commercial varieties tested showed any difference in susceptibility to the disease.

MITRA (M.) & SUBRAMANIAM (L. S.). **Fruit-rot disease of cultivated Cucurbitaceae caused by Pythium aphanidermatum (Eds.) Fitz.**—*Mem. Dept. Agric. India*, Bot. Ser., xv, 3, pp. 79–84, 3 pl., 1928.

Of recent years considerable damage has been caused to culti-

vated Cucurbitaceae at Pusa during the monsoon by the fruit-rot due to *Pythium aphanidermatum* [*R.A.M.*, v, pp. 72, 213]. The fungus was isolated from *Luffa acutangula*, *L. aegyptiaca*, *Trichosanthes anguina*, *T. dioica*, *Cucumis sativus*, *C. melo* var. *momordica*, *Lagenaria vulgaris*, and *Momordica charantia*, and cross-inoculation experiments were carried out with positive results in each case. At the same time, all the cucurbit strains were inoculated on the hosts of the closely allied fungus previously described by Subramaniam under the name *P. butleri* (papaw, chilli pepper, tobacco, and ginger), while *P. butleri*, isolated from papaw, was inoculated on the cucurbit hosts of *P. aphanidermatum*. The fungus from papaw caused rotting of all the cucurbits, but those from the latter hosts were unable to produce the typical symptoms of foot rot on papaw, though they infected papaw fruits and in some cases caused a soft rot of the base of the trunk. On tobacco and ginger the cucurbit strains caused a weak infection which failed to progress after a few days, while on chilli pepper no infection occurred when these strains were used.

The oogonia and oospores of the cucurbit strains are slightly smaller than those on the other hosts, but are otherwise similar. The oogonia (average of 50) from the various cucurbits ranged from 21·5 to 25·5 μ and the oospores from 16·3 to 20 μ, whereas from papaw they were 26 and 21 μ, respectively. The sporangial characters are similar on all the hosts. Zoospores (of which 15 to 60 may be contained in each sporangium) are not produced on solid media but are liberated freely within six hours in water cultures on boiled ants.

The morphological similarity and the results of the cross-inoculation tests are regarded as establishing that *P. butleri* is only a strain of *P. aphanidermatum*.

CHARLES (VERA K.) & POPENOE (C. H.). **Some Mushroom diseases and their carriers.**—*U.S. Dept. of Agric. Circ.* 27, 9 pp., 1 fig., 1928.

This is a popular account of the two fungous diseases of cultivated mushrooms [*Psalliota arvensis* and *P. campestris*] which are stated to be the most widespread and troublesome in the United States, and both of which are believed to have been introduced from Europe. Locally these diseases are known under the names of 'bubbles' (*Mycogone*) [*perniciosa*: *R.A.M.*, v, p. 719], and plaster-mould disease [? *Monilia fimicola* or *Verticilliopsis infestans*: ibid., v, p. 592]. Particular stress is laid on the highly infectious nature of the diseases (which have been shown to be carried by insects, especially flies, and by human agency), and on the necessity of taking strict sanitation measures, such as insect control by fumigation in the mushroom houses, the removal of all infected material to considerable distances from the houses or its destruction by fire, disinfection of the clothing of workmen employed in infected houses and of all the implements used by them, and the like. Detailed instructions are given in regard to the best methods of fumigation with formaldehyde, nicotine, and hydrocyanic acid gas, and to the use of suitable insecticides.

Beckerich (A.). **Il faut rajeunir les méthodes de traitement des Vignes. Cuivre et polysulfures de chaux.** [Vine treatment methods must be modernized. Copper and polysulphides of lime.]—*Rev. de Vitic.*, lxviii, 1752, pp. 57–62, 1928.

During 1927, French vineyards suffered severely from extensive attacks of mildew [*Plasmopara viticola*: *R.A.M.*, vii, p. 359] in spite of repeated applications of copper mixtures. In Anjou, the harvest was saved only after 10 or 12 such applications; in Touraine so many treatments were given that the leaves and fruit were killed; in Charente by 1st July, and after six copper sulphate applications, few vineyards remained free from brown rot [the disease caused by *P. viticola* on the fruit]; Bordeaux suffered severely; and in the vicinity of Carcassonne serious injury was caused in June, even after numerous applications of mixtures containing 2 to 3 kg. copper sulphate per hl.

In view of these facts, the author considers that more use should be made of lime-sulphur preparations and mentions that a very old vineyard so treated increased its yield of wine from 20 or 30 to 48 hl. He recommends that the first application (4 kg. lime-sulphur to 100 l. water) should be given between harvest and November, followed by a second at the same concentration in February. During spring and summer, applications should be given alternately at ten days' intervals of lime-sulphur (1·5 to 2 kg. per hl. water) and of a copper sulphate mixture (2 kg. per hl. water), the leafy parts at the foot of the vine being kept well covered with the fluid. The fewer applications (four summer sprayings should suffice) necessitated by this method are stated to reduce the labour costs involved in treatment with copper sulphate mixtures alone by 40 per cent.

Müller (K.). **Unterausschuss für Schädlingsbekämpfung des Deutschen Weinbauverbandes.** [Sub-Committee for Pest Control of the German Viticultural Association.]—*Allg. Weinzeit.*, xlv, 2, pp. 24–26, 1928.

At a meeting of the Sub-Committee for Pest Control of the German Viticultural Association, held at Freiburg on 25th and 26th November, 1927, it was resolved that in future new disinfectants should only be passed for general use in vineyards after being tested in at least eight localities. Nosperit (liquid and dust) and nosprasit dust were recommended for the combined control of *Peronospora* [*Plasmopara viticola*] and the vine moths [*Clysia ambiguella* and *Polychrosis botrana*: cf. *R.A.M.*, vii, p. 138]. Horst dust [ibid., vii, p. 358] in its present form has been found to cause injury to the vines and is also less effective than cusisa and nosperit.

Gard (M.). **Sur le traitement de l'apoplexie de la Vigne par l'arséniate de soude.** [On the treatment of Vine apoplexy with arsenate of soda.]—*Comptes rendus Acad. d'Agric. de France*, xiv, 3, pp 90–95, 1928.

The writer's recent experiments in three different localities in the south-west of France have shown that good control of vine apoplexy [*Stereum hirsutum*: *R.A.M.*, vii, p. 220] may be obtained

by the addition of 250 gm. of arsenate of soda to the first application of Bordeaux mixture.

Ravaz (L.). **Un cas spécial de chlorose des Vignes américaines greffées.** [A special case of chlorosis of American grafted Vines.]—*Prog. Agric. et Vitic.*, lxxxix, i, pp. 10–12, 1 col. pl., 1928.

At the National School of Agriculture, Montpellier, where ungrafted vines elsewhere highly susceptible to chlorosis show no appreciable signs of the disease, the Rupestris variety, which is used for stocks, remains free from the disease when ungrafted or grafted with Viniferas, but when grafted with Labrusca, Lincecumii, or Rubra varieties, or certain hybrids of them [which are listed], sometimes develops badly affected scions. The disease appears and vanishes more rapidly than is the case with other grafted or non-grafted vines in soil favouring chlorosis.

Biffen (R. H.). **Annual Report for 1927 of the Botanist.**—*Journ. Roy. Agric. Soc. of England*, clxxxviii, pp. 313–320, 1927. [Received May, 1928.]

This report contains, *inter alia*, the following references of phytopathological interest. 'Whiteheads' of wheat (*Ophiobolus*) [*graminis*] was reported from a part of Norfolk where wheat was sown for the first time, so that the fungus was evidently introduced with the seed.

Severe outbreaks of black rust of wheat (*Puccinia graminis*) occurred in Hampshire and Northumberland. This disease is becoming increasingly prevalent in England and can now be found almost invariably wherever the ripening of the crop is slightly delayed.

The two chief diseases of sugar beet reported were those caused by *Peronospora schachtii* and *Phoma betae.* A wrinkling of the leaves, accompanied by golden-yellow discoloration of the veins, reported late in the season, may have been due to mosaic, but the cause was not definitely ascertained.

Pea seedlings were attacked by *Fusarium vasinfectum.*

Beaumont (A.) & Hodson (W. E. H.). **Fourth Annual Report of the Seale-Hayne Agricultural College, Newton Abbot, Devon, for the year ending September 30th, 1927.**—29 pp., 1928.

The following items on the prevalence of plant diseases in the south-west of England, chiefly in Devon and Cornwall, are of interest in this report, which is prepared on similar lines to those of previous years [*R.A.M.*, vi, p. 529]. Potato blight [*Phytophthora infestans*] was reported in the Penzance area on 27th April and again on 28th June; it was observed near Plymouth early in July, by the end of which month it was general throughout the two counties. The nine Swiss potato varieties tested for their reaction to late blight were all susceptible, particularly Blochinger and Weltwunder.

Leaf and pod spot of garden peas (*Ascochyta pisi*) was unusually prevalent. Downy mildew (*Peronospora viciae*) is always common on late-sown peas in Cornwall. Powdery mildew (*Erysiphe poly-*

goni), which is also general at the end of the season, was particularly severe and ruined one crop of peas before picking. Root rot of peas (*Aphanomyces euteiches*) [ibid., vii, p. 354], recorded for the first time in the south-west and still rare in England, caused much damage in one locality of South Devon.

American gooseberry mildew (*Sphaerotheca mors-uvae*) was more severe than in previous years. Of the four preparations (sodium polysulphide, lime-sulphur, ammonium polysulphide, and washing soda) used in a spraying demonstration on 10th May, the last-named (5 lb. in 25 galls. water) gave the best results, and was successfully used elsewhere.

Strawberry mildew (*S. humuli*) was unusually prevalent. The study of patch and red plant of strawberries [ibid., iv, p. 462; vii, p. 181] has been continued in co-operation with the Long Ashton Research Station. Various other obscure strawberry diseases are under investigation in different areas. 'Miffy' or 'spindly' plants are characterized by small leaves with disproportionately long petioles, small crowns, and few or no flowers. Both runners and mature plants may be affected and the condition is often confused with red plant. The cause of miffy plants is injury to the roots or crown. Experiments have shown that a certain proportion of miffy runners generally recover and form normal plants, and it is therefore unnecessary to hoe them all out. Small leaf disease is typified by the production of numerous dense crowns, small, yellowish-green foliage, and short, thick petioles. This condition has been experimentally produced by waterlogging at Long Ashton and is, therefore, probably due to poor drainage. It rarely occurs in the south-west. Cauliflower disease [loc. cit.], which is very common in some gardens, can be controlled by roguing. In plants affected by leaf curl the leaves are puckered at the edges, somewhat crinkled and distorted, and yellowish. The whole plant may be smaller than usual, with numerous weak, dense crowns, while the crop may be considerably reduced. Recent work at Long Ashton points to the strawberry aphis (*Capitophorus fragariae*) as the cause of the trouble. This disease often develops into patch [loc. cit.], which is stated to be the most extensive and serious trouble in the Tamar Valley.

Trabajos de las Estaciones de Fitopatología Agrícola. [Work of the Stations of Agricultural Phytopathology.]—*Bol. Pat. Veg. y Ent. Agric.*, ii, 8–9, pp. 163–181, 1927. [Received June, 1928.]

The following references, *inter alia*, are of interest in this report. *Bacterium briosii* was determined as the cause of bacteriosis of tomatoes at Colindres (Santander) and Madrid [*R.A.M.*, vi, p. 147]. *Phytobacter lycopersicum* occurred on tomatoes at Adra (Almeria).

Many Almerian vines affected by a yellow discoloration were found to contain the mycelium of a fungus (possibly *Stereum necator*) [*S. hirsutum*: see above, p. 489], good results in the control of which were given by dormant applications of sodium arsenate and soap.

Olive trees in the province of Seville were attacked by *Bact.* [*Pseudomonas*] *savastanoi* [ibid., vi, p. 527] and *Macrophoma dalmatica*.

SMITH (F. E. V.). **Report of the Government Microbiologist.**—*Ann. Rept. Dept. of Agric. Jamaica for the year ended 31st December, 1927*, pp. 18–20, 1928.

During the period covered by this report (26th April to 31st December, 1927) there has been an increase in the number of bananas treated for Panama disease (*Fusarium cubense*) [*R.A.M.*, vi, p. 42], some 70 per cent. of the total being in the parish of Portland. An extension of the reduced treatment (eight roots in addition to the diseased one) has been authorized for any part of the Island in which the Director considers it justified. The records show that 40,000 diseased roots were dealt with during the year. The hybrids derived from crossing *Musa kewensis* (a non-edible species) with various edible bananas appear to require 3 to 4 years to attain the fruiting stage. On the other hand, a number of hybrids between edible species may be expected to bear fruit $2\frac{1}{2}$ years after sowing. It is hoped that continuous efforts in the raising of cross-fertilized banana seedlings (of which 114 are now under trial) will ultimately result in the production of the immune commercial banana essential to solve the Panama disease problem. The China, Robusta, Bumelan, and Lacatan 'immune' varieties are at present being tested. The Glengoffe variant of Gros Michel and the local upland variety Otaheite have been found to be highly susceptible.

The Bonnygate disease (*Sphaerostilbe musarum*) and black spot (*Cercospora musarum*) of bananas are still occasionally encountered in districts favourable to their occurrence.

The prevalence of mosaic disease of sugar-cane is decreasing sufficiently to warrant many estates discarding the resistant Uba variety in favour of the susceptible but otherwise superior B.H. 10(12) and Ba. 11569 [p. 8].

Isolated cases of bud rot of coco-nuts [*Phytophthora palmivora*: ibid., vi, p. 608] were reported from St. Thomas's and elsewhere.

A single case of thread blight injury to the tips of grapefruit twigs by *Corticium* (?) *koleroga* was recorded [ibid., vii, p. 454].

Brown eye spot of coffee (*Cercospora coffeicola*) was common but rarely serious. Leaf mould of tomatoes (*Cladosporium fulvum*) was very prevalent.

Mosaic diseases are stated to be widespread in Jamaica on beans, Solanaceae, and other plants.

DASTUR (J. F.). **Annual Report on the Mycological Section for the year ending March, 1927.**—Reprinted from *Rept. Dept. of Agric., Central Provinces and Berar, for the year 1926–27*, 7 pp., 1928.

Further evidence was obtained that cotton wilt in the Central Provinces is not directly due to *Fusarium* attack [*R.A.M.*, v, p. 594, and below, p. 511]. It has repeatedly been shown that the disease is checked by the cultivation of jowar [sorghum] in wilted soil. Plants grown in heavily manured, non-wilted soils frequently became wilted in pot culture experiments, and typical symptoms also developed in plants injected through the roots, petioles, or branches with dilute solutions of aluminium salts. At the same

time, plants similarly injected with distilled water, with or without a heavy suspension of *Fusarium* spores, remained healthy. The hyphae of the fungus were further found in the tissues of otherwise perfectly normal plants, and it cannot, therefore, be regarded as the immediate cause of wilt.

The local Poona and Cawnpore varieties of gram [*Cicer arietinum*] as well as the Deshi variety, again proved resistant to wilt [*F.* sp.: ibid., vi, p. 208], while red gram from Karachi and No. 28 were very susceptible.

The use of copper carbonate dust is now officially recommended for the control of sorghum smut [*Sphacelotheca sorghi*].

A disease of rice resembling straighthead [ibid., i, p. 83] caused considerable damage to the crop in various localities.

The chief causes of decay in stored potatoes are *F.* sp., *Rhizoctonia* sp., bacteria, high temperatures, and the storage of bruised or wounded tubers.

Two species of *Helminthosporium*, *Acrothecium* sp., *F.* sp., *Phoma* sp., and *Ophiobolus* sp. (the last-named reported for the first time in India), were isolated from the pinched and blackened grain of a wheat crop at Sindewahi. The pathogenicity of these fungi has been established, and some were shown to cause foot rot in various localities. Treatment with copper carbonate, germisan, or uspulun has been found to control this last disease, which is severe on early-sown wheat in the Central Provinces.

MARTIN (G. H.). **Diseases of forest and shade trees, ornamental and miscellaneous plants in the United States in 1926.**—*Plant Disease Reporter, Supplement* 55, pp. 334–393, 1927. [Mimeographed. Received June, 1928.]

This report, prepared on similar lines to those of previous years [*R.A.M.*, vi, p. 214], contains a number of interesting references (including many new records), of which the following may be mentioned. Cedar blight (*Phomopsis juniperovora*) caused serious damage in the Middle West to seedling nursery stock of red cedar (*Juniperus virginiana*), especially under humid conditions and where spraying with Bordeaux mixture was omitted. A planting of Savin junipers (*J. sabina*) at Newark, Ohio, was also generally infected by *P. juniperovora*, which destroyed entire plants in one to two years. The same organism was also found on *Cupressus arizonica*, *C. sempervirens*, and *Cryptomeria japonica* in North Carolina, the last-named host being further severely attacked in Alabama. The disease was also prevalent in Rhode Island.

Sitka spruce (*Picea sitchensis*) was infected by *Aleurodiscus subcruentatus* in Oregon and California, by *Corticium ermineum* in Vermont and Idaho, and by *C. rubicundum* in Colorádo, all these being reported for the first time. *A. subcruentatus* and *C. racemosum* were further recorded for the first time on Douglas fir (*Pseudotsuga douglasii*), the former from Oregon and California, and the latter from Idaho, Washington, and British Columbia. *C. ermineum* and *C. racemosum* were reported on *Thuja plicata* for the first time in Vermont and Idaho, and *C. racemosum* on the same host in Idaho, Washington, and British Columbia.

A *Scleroderris*, which may be either *S. bacillifera* or *S. treleasei*, occurred in a destructive form on western white pine (*Pinus monticola*) at an altitude of 1,500 to 2,000 ft, in Clallam County, Washington. Many branches on trees up to 40 ft. high were killed.

The chestnut blight (*Endothia parasitica*) survey conducted in 1926 by the United States Office of Forest Pathology showed that every county within the commercial range of *Castanea dentata* was infected. West of a line extending from the south-west corner of Pennsylvania to the north-west corner of Georgia the infection has now reached from 1 to 10 per cent. In connexion with the increasing development of blight-resistant varieties, some very resistant exotic chestnuts have been discovered and are undergoing further tests.

Rust (*Puccinia hibisciata* (Schw.) Kell.) of hollyhocks (*Althaea rosea*) was reported from Kingman County, Kansas. This is believed to be only the second record of *P. hibisciata* in the United States, the first being in North Dakota (1902).

China asters (*Callistephus chinensis*) were attacked for the first time in the District of Columbia by blackleg (*Phytophthora* sp.). Another new record on this host is curly top, which caused losses of 10 to 15 per cent. in Oregon. The symptoms and circumstantial evidence suggest that the condition is due to the curly top virus [of beets: cf. ibid., vi, p. 455], but this has not yet been proved. The hot, dry season apparently favoured the insect carrier.

Crown rot of iris (*Sclerotium* sp. closely allied to *S. rolfsii*) has been very abundant in Indiana, and an apparently identical disease occurs on delphinium, columbine [*Aquilegia vulgaris*], and golden glow [*Rudbeckia laciniata* var. *hortensia*] at Indianapolis.

Foot and stem rot of lilies (*Lilium* spp.) was caused in North Carolina by *Phytophthora cactorum*, this being the first record of the disease.

Root rot (*Armillaria mellea*) was observed for the first time on *Phoenix canariensis* at Watsonville, California.

Forward steps in farm science.—*Ann. Rept. Wisconsin Agric. Exper. Stat. 1926–1927* (*Bull.* 396), 135 pp., 33 figs., 1 map, 1927. [Received April, 1928.]

Among other items of phytopathological interest in this report, the following may be mentioned. Tobacco mosaic appears to be on the increase, and recent studies have shown that the virus may remain alive for many years under dry conditions. The occurrence of mosaic epidemics is attributed primarily to the overwintering of the virus in curing sheds and field refuse, and only in a secondary degree to infection from alternate hosts and dissemination by insects.

Cherry leaf spot [*Coccomyces hiemalis*] occurred in a severe form during 1927, many orchards suffering heavy losses by 15th July. Bordeaux mixture (3–3–50) was somewhat more effective than lime-sulphur (1 in 40) in the control of the disease.

On Fameuse apples suffering from fireblight, 6·6 per cent. of the cankers and 3·4 per cent. of the infected twigs examined in early

spring were found to contain the causal organism [*Bacillus amylovorus*]. Transcendent Crab and Wealthy apples also showed a high proportion of overwintered cankers, while Dudley, McIntosh, and Northwestern Greening gave little evidence of this type of infection. The first bacterial exudation from overwintered cankers was observed on Fameuse on 19th April, the period of most active production extending from 19th May to 14th June. The first blighted flower-bud clusters and twigs were found before the blossoms opened. No evidence of insect-borne primary infection was obtained. Rain was apparently much more important than insects in the dissemination of the blossom blight phase of the disease. Trees with numerous hold-overs showed abundant blossom blight, which also occurred to a limited extent on healthy trees in proximity to these centres of infection. Aphids and leafhoppers were the chief insect disseminators of secondary twig blight, which was also carried by rain. Some reduction in the incidence of blossom blight was effected by the excision of the diseased portions of the trees in plots of 100 trees each. No benefit was derived from the application of 3–4–50 Bordeaux mixture just before the blossoms opened.

Seedling blight and ear rot of maize (*Gibberella saubinetii*) has been found to occur in a much more severe form in crops following wheat or maize than in those succeeding oats, clover, lucerne, or other pasture. A correlation has been observed between susceptibility to *G. saubinetii* in wheat and maize seedlings and the relative amount of pentosans present [*R.A.M.*, v, p. 546]. In culture the pentosans and pectins induce a luxuriant growth of the fungus.

Certain selections made from crosses between the black hulled and Oderbrucker barleys have shown a high degree of resistance to stripe [*Helminthosporium gramineum*].

Numerous cases were observed in which infection from a single barberry bush led to attacks of *Puccinia graminis* on cereals extending over an area several miles in width and 8 to 10 miles long on the windward side.

Neck rot of white onions (*Botrytis byssoidea* and *B. squamosa*) [ibid., vi, p. 267] may be largely controlled by the rapid drying of the bulbs in an air current at 100° to 120° F.

The bacterial blight of beans [*Bacterium phaseoli*: ibid., vi, p. 340] may infect over 80 per cent. of the plants before blossoming under certain meteorological conditions, including moist, warm weather and high winds during early growth. Both the standard varieties cultivated for canning in Wisconsin, Green Refugee and Refugee Wax, are relatively resistant, as also are Giant and Burpee's Stringless Green Pod; the Improved Kidney Wax, Wardwell, Bountiful, Full Measure, and Dwarf Horticultural varieties are susceptible.

Bean mosaic does not appear to be transmitted through the soil or by ordinary contact, but positive results were obtained by inoculating the juice of diseased plants into severely mutilated or bruised leaves. Three species of aphids, mealy bugs, and possibly leafhoppers were found to act as vectors of the disease in the field [cf. ibid., vii, p. 418].

ADAMS (J. F.). **Report of the Plant Pathologist for 1927.**—*Quart. Bull. State Board of Agric., Delaware*, xviii, 1, pp. 3–29, 5 figs., 1928.

In connexion with the campaign against wheat bunt [*Tilletia levis*] which is being actively pursued in Delaware, it is stated that the co-operation of the millers proved of great assistance in persuading farmers to apply proper treatment. Four treating stations now exist, and during 1927 these alone treated 20,801 bushels of wheat, which was approximately equivalent to all the wheat treated in the State during 1926, and nearly one-third of the total treated in 1927. The figures for the years 1925 to 1927 are 5,800, 20,600, and 66,035 bushels of wheat treated, respectively.

Seed maize disinfection with chlorophenol-mercury dusts was continued in the attempt to increase yield and reduce the number of soft ears by controlling root rot diseases [*Cephalosporium acremonium*, *Diplodia zeae*, *Gibberella saubinetii*, and *G. moniliformis*: *R.A.M.*, iii, p. 31] of this crop. The method proved as successful as the 'rag doll' germinator method of selection [ibid., ii, p. 442] and involved much less time. The cost of the disinfectant works out at about only 3 cents per acre, and for this an average increase of 3·5 bushels per acre was obtained.

Notes are also given on the prevalence of various diseases of crops and other cultivated plants during the period covered.

STANER (P.). **Belgian Congo: some diseases of cultivated plants.**—*Internat. Bull. of Plant Protect.*, ii, 2, p. 17, 1928.

A large number of oil palms (*Elaeis*) [*guineensis*] have been destroyed by a species of *Thielaviopsis* at Flandria, where the leaves of the same host are also subject to attack by *Colletotrichum* sp.

The *Cassia tora* crop at Eala is being destroyed by *Aecidium torae*.

Sclerotinia sp. is causing much damage to *Manihot utilissima* at Lake Leopold II.

LINK (G. K. K.) & LINK (ADELINE de S.). **Further agglutination tests with bacterial plant pathogens. I. Bacterium campestre—Bact. phaseoli group; Bact. medicaginis var. phaseolicola; Bact. tumefaciens.**—*Bot. Gaz.*, lxxxv, 2, pp. 178–197, 1928.

By means of an agglutination test [the experimental procedure of which is described and the results tabulated: cf. *R.A.M.*, vi, pp. 650, 651], it was found possible to differentiate *Bacterium malvacearum* (causing angular leaf spot of cotton) from the allied yellow organisms *Bact. campestre* [*Pseudomonas campestris*] (black rot of crucifers), *Bact.* [*P.*] *citri* (citrus canker), *Bact. cucurbitae* (leaf spot of squash), and *Bact. pruni* (plum and peach canker), as well as from other organisms of the same general type.

When the antiserum of *Bact. malvacearum* is tested against suspensions of *Bact. phaseoli* var. *sojense* (blight of soy-beans), a specific differentiating agglutination is obtained, but this is not the case with the antiserum of the latter used against suspensions of the homologous organism and of *Bact. malvacearum*.

The yellow organisms tested are not considered to fall within a single serological group. *Bact. malvacearum* appears to be more closely related serologically to *Bact. phaseoli*, *Bact. phaseoli* var. *sojense*, and an unnamed yellow organism (*Bact. X*) than to *P. campestris* and *Bact. flaccumfaciens*.

Bact. medicaginis var. *phaseolicola*, a white organism producing symptoms on beans practically identical with those caused by *Bact. flaccumfaciens*, can be differentiated by the agglutination test from the latter and from the other bean pathogens, *Bact. phaseoli* and *Bact. phaseoli* var. *sojense*.

Highly specific agglutination occurs when the antiserum of *Bact. tumefaciens* is tested against suspensions of the homologous and of various heterologous organisms; when the antisera of the latter are tested against suspensions of *Bact. tumefaciens*, agglutination generally takes place in the lower dilutions.

LINK (G. K. K.) & TALIAFERRO (W. H.). **Further agglutination tests with bacterial plant pathogens. II. Soft-rot group: Bacillus aroideae and B. carotovorus.**—*Bot. Gaz.*, lxxxv, 2, pp. 198–207, 1928.

The agglutination test was successfully used in experiments [the results of which are described and tabulated] to differentiate *Bacillus aroideae* and *B. carotovorus* [*R.A.M.*, iv, p. 196] of the soft-rot group from *Bact. campestre* [*Pseudomonas campestris*] of the *Bact. campestre-Bact. phaseoli* group, from *Bact. medicaginis* var. *phaseolicola*, and from *Bact. tumefaciens*.

B. aroideae and *B. carotovorus* were found to be closely related serologically, but the existence in each of specific antigens is thought to justify their retention as distinct species [cf. ibid., vii, p. 229].

PONZIO (M.). **Esperienze di irradiazione selettiva su tumori vegetali.** [Experiments in selective irradiation on plant tumours.]—*Giorn. R. Accad. Med. Torino*, v, 6, pp. 342–344, 1928.

A brief account is given of the writer's experiments in the irradiation, by Röntgen rays of varying wave-lengths, of tumours produced on *Pelargonium zonale* by inoculation with *Bacterium tumefaciens* [*R.A.M.*, vii, p. 146]. It was shown that irradiation with rays of medium wave-length (KV 120, 2 mm. Al filter, 0·12 λ, 4·5 ED) was more prompt and efficacious in causing arrest of growth and desiccation of the tumour than that with longer ones, which did not always effect complete involution. The latter process was accompanied in favourable cases by a resumption of vegetative activity in the affected plant, and by the cicatrization of the injured area.

STEWART (G.). **Origin of a segregate resistant to black stem rust in a cross between two susceptible parents.**—*Amer. Naturalist*, lxii, 679, pp. 188–192, 1928.

Important results have recently been obtained at the Utah Experiment Station with various crosses between pure lines of Sevier and Federation wheat, the former variety being partially suscept-

ble (some pure lines wholly susceptible and some semi-resistant) and the latter wholly susceptible to black stem rust [*Puccinia graminis*]. Homozygous segregates have been obtained, some of which show a semi-resistant reaction to the disease, while others give a reaction of the truly resistant type.

Tests with these crosses were made for rust resistance at University Farm, St. Paul, Minnesota, during the growing seasons of 1926 and 1927. Out of 81 segregates tested in 1926, one was resistant and ten semi-resistant, the former and one of the latter group being derived from a cross in which the Sevier pure line was not known. In 1927, when 84 segregates were tested, 17 were semi-resistant and one highly resistant. One of the parents of this last segregate, Federation, was fully susceptible and the other, Sevier No. 59, only slightly semi-resistant.

The data obtained in these experiments frequently show that there is a recombination of genetic factors resulting in the production of segregates with more resistance to black stem rust than either of the parental lines. This tends to support the opinion suggested by the results of the author's earlier work [*R.A.M.*, vi, p. 282] that resistant lines arise by transgressive segregation. The present investigations are thought to furnish conclusive proof of the occurrence of highly important recombinations of the genetic factors concerned with the inheritance of reaction to black stem rust, whereby resistant lines are obtained from crosses between susceptible ones.

No evidence was obtained of any correlation between resistance to black stem rust and susceptibility to leaf rust [*P. triticina*: *R.A.M.*, vii, p. 79].

Appel [O.]. **Der gegenwärtige Stand der Getreiderost-Frage.** [The present status of the cereal rust problem.]—*Mitt. Deutsch. Landw. Gesellsch.*, xliii, 12, pp. 253–257, 8 figs., 1 map, 1928.

After a general discussion on the problem of the cereal rusts and their control, the writer describes the investigations on biological specialization in brown rust of wheat (*Puccinia triticina*), now proceeding at the Biologische Reichsanstalt, Dahlem, Berlin.

Material was examined in 1927 from twelve different localities, extending from Finland diagonally through Germany to Upper Bavaria, and four distinct strains of the fungus were differentiated. Three of these (forms 11, 13, and 14) were of common occurrence, while the fourth (15) was found only at the summit of the Thuringian forest. Form 13 predominates in the north-east, while 11 and 14 occur mainly in central and south Germany. Only one of the twelve strains distinguished in the United States [*R.A.M.*, v, p. 477] has so far been found in the German material, viz. form 11 : forms 13, 14, and 15 are additional forms not previously recognized. Form 13 attacked virulently nearly all the 11 varieties of wheat used in the tests, only Mediterranean and Democrat remaining immune. On the other hand, these two varieties and Michigan Amber were heavily infected by form 15, from which the remainder of the wheats proved immune.

The effect of climatic and nutritional conditions on the incidence of the cereal rusts are discussed, with special reference to various

proposals for the control of yellow rust (*P. glumarum*) [see next abstract].

BONNE. **Ein Beitrag zur Gelbrostfrage.** [A contribution to the yellow rust question.]—*Pflanzenbau*, iv, 16, pp. 241–250, 1 fig., 1 graph, 1928.

The results of the writer's investigations at Schlanstedt on the factors influencing the development of yellow rust of wheat (*Puccinia glumarum*) are fully described, references to current studies on this subject being also given [*R.A.M.*, vii, p. 22]. Volunteer wheat seedlings were found bearing numerous uredosori of *P. triticina* and a few of *P. glumarum* on 10th October, 1927. Only seedlings with four or more leaves were affected. The infection continued to develop up to 24th December, in spite of the fact that there was a period of heavy frost, with a minimum temperature down to −24° C., and a fall of snow in December.

Attempts to reduce infection with yellow rust by removing the leaf tips (the early attacks in the spring being mainly towards the tip of the leaf) were made in 1927, but the damage to the plants thereby caused quite outweighed any advantage gained by reducing the rust.

The maximum amount of infection was observed about the middle of June both in 1926 and 1927, but in the latter year severe outbreaks also occurred during the second half of March and the early part of May. Notes are given on the reaction to infection of a number of wheat varieties at the Schlanstedt plant-breeding station.

WACHS. **Welche Nutzanwendungen lassen sich aus den Beobachtungen der praktischen Landwirte für die Bekämpfung des Getreiderostes ziehen?** [How can the observations of practical farmers on the control of cereal rust be usefully applied?] —*Mitt. Deutsch. Landw. Gesellsch.*, xliii, 12, pp. 257–259, 1928.

From the replies to a questionnaire circulated among the farmers of his acquaintance, as well as from a study of the relevant literature and from oral communications, the writer has selected some practical hints on the control of yellow rust of wheat [*Puccinia glumarum*]. Good results have been obtained by autumn fertilization with calcium cyanamide, and this suggests that Hermannes's proposal for the application of unoiled calcium cyanamide [*R.A.M.*, vii, p. 22] should be given an extended trial. With regard to the influence of the preceding crop on the development of yellow rust, it seems to be the general opinion that leguminous crops (especially clover) are more injurious in this respect than root crops. The reduction of light has also been found to cause an increase of infection.

BODNÁR (J.). **Neue Bekämpfungsmethode gegen Flugbrand.** [New methods for the control of loose smut.]—*Növényvédelem*, iii, 8, 1927. (Hungarian). [Abs. in *Fortschr. der Landw.*, iii, 9, p. 419, 1928.]

The loose smuts of cereals [*Ustilago* spp.] were effectively con-

trolled at the Royal Hungarian Biochemical Institute by immersion of the seed-grain in a 0·2 per cent. solution of tillantin, higosan, or germisan heated to 52° C.

Petit (A.). **Résultats d'expériences faites au sujet du traitement de la carie du Blé.—Avantages de certains sels de cuivre.** [Results of experiments in the treatment of Wheat bunt.—Advantages of certain copper salts.]—*Comptes rendus Acad. d'Agric. de France*, xiv, 5, pp. 157–162, 1928.

The writer's experiments in the control of wheat bunt [*Tilletia tritici* and *T. levis*] in Tunis have demonstrated the efficiency of dusting the seed-grain with copper chloride and white talc at the rate of 250 gm. per quintal [about 2·4 oz. per bush.]. Anhydrous copper sulphate, copper acetate, and other copper salts are of value only in cases of mild infection.

Straib (W.). **Versuche mit Düngemitteln zur Steinbrandbekämpfung des Weizens.** [Experiments with fertilizers for the control of Wheat bunt.]—*Fortschr. der Landw.*, iii, 3, pp. 110–114, 1928.

The results of the experiments carried out by various workers in the attempt to control wheat bunt (*Tilletia tritici*) by means of fertilizers are summarized, and a brief account given of the writer's own trials (1925 to 1927) with calcium cyanamide, calcined lime, and superphosphate used as dusts at the rate of 5, 10, or 20 gm. per kg. of seed-grain. The results of the tests [which are tabulated] were not altogether unfavourable, but they are not considered to justify further attempts in this direction in Germany.

Andreyeff (N. I.). Результаты испытаний некоторых фунгисидов при борьбе с твердою головнею Пшеницы. [Results of tests of some fungicides for the control of Wheat bunt.]—*Bull. North Caucasian Plant. Prot. Stat.*, Rostoff-on-Don, iii, pp. 93–122, 1927. [German summary. Received June, 1928.]

In this paper a detailed description is given of experiments made in 1926 and 1927 to test the efficacy of various fungicides in the control of wheat bunt, *Tilletia foetans* [*T. levis*]. The tests were made at the Rostoff-Nakhitchevan Agricultural Experiment Station and at the Phytopathological Section of the Don Institute of Agriculture in Persianovka with naturally and artificially infected seed-grain of a highly susceptible spring wheat (*Triticum vulgare* f. *albidum* No. 0721), and of winter wheat (a mixture of *T. erythrospermum* and *T. ferrugineum*). The fungicides tested were solutions of formalin, copper sulphate, uspulun, tillantin B; and dusts of dehydrated copper sulphate, plant ashes with a small admixture of copper sulphate, copper carbonate, Schweinfurt (Paris) green, sodium arsenite, calcium arsenate, uspulun [tillantin R], tutan, abavit B, and höchst [tillantin].

All the dusts tested gave satisfactory results, particularly in the case of the winter wheat, in which the percentage of infection of the resulting plants was reduced from 43 in the control plots to 0·4 by abavit B, 0·5 by tillantin and sodium arsenite (the latter, however, had a rather injurious effect on the germination of the

seed under laboratory conditions), 1·1 by tutan, 1·6 by Paris green, 2·4 by dehydrated copper sulphate, 2·8 by tillantin R, 3·6 by calcium arsenate, and 3·7 by ash with copper sulphate. With the spring wheat the results were entirely comparable, but the reduction of infection was less marked (on the average, from 69·1 to 16·7 per cent. in the first year's tests, and from 20·6 to 1·9 per cent. in the second year). Among the liquid fungicides, tillantin B was the most efficacious, the resulting crops being almost entirely free from infection; uspulun reduced the infection to 3·3 per cent. in the first year and to 1·1 per cent. in the second year. Formalin had the drawback, as also had the 1 per cent. copper sulphate solution, of considerably lowering the germinability of the seed (by up to 25 per cent.) and the yield of the crop (by from 10 to 15 per cent.).

Observations made during the two years showed that none of the fungicides tested had any effect on the degree of infection of wheat with loose smut (*Ustilago tritici*). The severity of infection with bunt was not found to be correlated with the degree of vigour of the wheat plants, and appeared to depend rather on the whole complex of environmental conditions, such as the constitution and relief of the soil, climate, and the like. There was some evidence that some of the dusts may have a stimulating effect on the vegetation of the plants, and in a few cases the grain from treated plants was of a slightly higher specific gravity. Among soft wheats, the highest susceptibility to bunt was observed in the varieties *T. vulgare* f. *ferrugineum*, f. *erythrospermum*, and f. *albidum*.

In conclusion, it is stated that although, under local conditions, formalin and copper sulphate are by far the cheapest disinfectants, the difficulty of their use in practice, their depressing action on the germinability of the seed, and the reduction in the yield of the crops caused by them, render it advisable to promote the use of dusts for the control of bunt, which is of considerable economic importance in the North Caucasus. Liquid uspulun and tillantin B are both too expensive and too complicated in their application to deserve recommendation.

Kuschke (J. E.) & Obermeister (N. P.). Опыты протравливания Пшеницы против головни различными фунгисидами в условиях Кубани. [Experiments in Wheat seed-grain disinfection with various fungicides for the control of bunt under the conditions prevalent in the Kuban.]—*Bull. North Caucasian Plant Prot. Stat.*, Rostoff-on-Don, iii, pp. 204–208, 1927. [German summary. Received June, 1928.]

Very brief details are given of a series of experiments made in the autumn of 1926 at the Kuban [North Caucasus] Plant Protection Station to test the efficacy of a number of liquid and dust fungicides [all of which were also comprised in the tests of the Rostoff Plant Protection Station; see preceding abstract] in the control of wheat bunt [*Tilletia levis*]. The tests were made with an unnamed variety of winter wheat. The best results, from the point of view of bunt control, were obtained with tillantin B and sodium arsenite, both of which reduced the infection to one infected ear for every 339 found in the control plots. Next in fungicidal

value came höchst [tillantin] dust and Paris green, followed (in the order of decreasing efficacy) by calcium arsenate, 1 per cent. copper sulphate solution, uspulun [tillantin R], 0·5 per cent. copper sulphate solution, 0·15 per cent. formalin, and dehydrated copper sulphate and lime dust.

It is pointed out that Paris green and sodium arsenite very considerably reduced the viability of the seed when tested in the laboratory, but seed dusted with these preparations and sown in the field immediately gave stands which were hardly any thinner than those in the control plots. The authors believe that this may possibly be due to a neutralizing effect of the soil on the toxicity of these salts.

Reichert (I.). **Comparative bunt resistance of Wheat in Palestine.**—*Zionist Organ. Inst. Agric. & Nat. Hist. Agric. Exper. Stat. Bull.* 9, 27 pp., 1928.

Twenty-two local and foreign wheat varieties, viz., 5 of *Triticum vulgare*, 15 of *T. durum*, 1 *T. polonicum*, and 1 *T. dicoccoides*, were grown from 1924 to 1926 at the experimental farm, Ben-Shemen, Palestine, to ascertain their comparative resistance to bunt (*Tilletia tritici*).

The results of the trials [which are tabulated] showed that all varieties of *T. durum* were very susceptible, infection ranging from 31·3 to 75·3 per cent. and averaging 25·88 per cent. during the whole period. The corresponding figures for *T. vulgare* were 0 to 54·9, with an average of 18·62 per cent. The only local variety of *T. polonicum* averaged 34·4 per cent., while the wild emmer, *T. dicoccoides*, showed 71·4 per cent. in 1924–5, thus contradicting the prevalent opinion as to the immunity of wild emmer.

Resistant strains were found only among the foreign varieties of *T. vulgare*. Florence, known in Australia and the United States as resistant [*R.A.M.*, iv, p. 660], proved entirely immune in Palestine, while Bunyip, which is highly susceptible in the above-mentioned countries, showed a high degree of resistance at Ben-Shemen (two years' average infection 1·3 per cent.).

These observations do not support the general view that *T. durum* varieties are uniformly more resistant to bunt than *T. vulgare*. Similar results have also been obtained in Bulgaria and Italy. This apparent contradiction is possibly explicable on the basis of the different origins of the two groups. According to Vavilov ('Studies on the origin of cultivated plants', Leningrad, 1926; *Bull. Appl. Bot.*, xxvii, p. 409, 1927), *T. vulgare* originated in the cold, mountainous region of south-west Asia, and is therefore more adapted to the infection conditions of bunt in the northern countries. The home of *T. durum*, on the other hand, was Abyssinia and the Mediterranean region, and it is therefore more liable to contract infection by *Tilletia tritici* in warmer countries. Sax's statement that a correlation exists between the number of chromosomes in the different wheat groups and their reaction to disease [*R.A.M.*, iii, p. 200] does not appear to hold good in the case of *T. tritici*.

The immunity and marked resistance, respectively, of the Florence and Bunyip varieties in Palestine, contrary to their habit in their

countries of origin, may possibly be explained by the existence of different physiological strains of *T. tritici*, or of resistant strains of wheat within the varieties.

The higher incidence of bunt infection among wheat sown in 1924 than that in the 1925 crop is believed to be due to the lower temperatures prevailing during the germination period (maximum 10·6° C. in 1924, compared with 15·2° in 1925). The more abundant soil moisture in 1924–5 may also have been a contributing factor in the development of infection.

GAGE (G. R.). **Studies of the life history of Ustilago avenae (Pers.) Jensen and of Ustilago levis (Kell. & Swing.) Magn.** —*Cornell Agric. Exper. Stat. Mem.* 109, 33 pp., 4 pl., 1927. [Received May, 1928.]

A detailed description is given of the investigation of the life-history of *Ustilago avenae* and *U. levis*, which was undertaken by the author in 1924 at the Cornell Agricultural Experiment Station, Ithaca, following the discovery by Zade and his students [*R.A.M.*, v, p. 547] of the germination of the spores of *U. avenae* at the time of pollination of oats and the initiation of infection of the glumes soon after. His experiments and field observations showed that on glumed and glumeless varieties of oats the spores of both smuts germinate at once or within a few days after reaching the stigma of the oat flower, and that the spores that lodge on the walls of the ovary also germinate in a very short time. The mycelium produced by these spores may invade the glumes, but the author does not believe that this mycelium plays any important part in the subsequent invasion of the seedlings, since in glumeless varieties it is entirely lacking. Much more important is the mycelium that was shown in the Cornell experiments [which are fully described] to penetrate the pericarp of the caryopses and to become established in and under the epidermal cells. This mycelium may develop and invade the pericarp at any moment from the blossoming period to harvest time, and even in storage when the oats are kept under conditions of humidity and temperature favourable to the parasite, and the indications were that it is responsible for most of the seedling invasion.

In addition, it was found that infection of the pericarp is not restricted to the blossoming period of the oats, although this is largely true of *U. avenae* and glumed varieties of oats, since the spores of this fungus, under local conditions, are disseminated over a period extending from shortly before pollination until harvest and must reach the ovaries of the flowers during the very short time that the latter remain open for pollination. With glumeless varieties infection with spores of *U. avenae* may occur in the field at any time after pollination and even during storage of the oats, but since most of the spores are disseminated in the field, most of the infection probably takes place prior to harvest. With *U. levis* and glumed varieties, the pericarp infection must be largely confined to the blossoming period, but with glumeless varieties, it doubtless also occurs after the grain has been threshed, since most of the spores of this species reach the oats at threshing time: it is

therefore probable that much of the infection ensues in storage. In general, it was noted that the length of the period during which inoculation is possible is the most important factor concerned with the resultant amount of smut.

In regard to the development of the disease in the field it is emphasized that temperature and moisture cannot be considered alone in an attempt to explain varying amounts of smutted plants in the crop. The success of invasion of the seedlings, resulting in the production of smutted panicles, is dependent upon certain combinations of environmental factors, rather than on any specific one. In general, slow germination and continued slow development of the plant favours the parasite, while rapid germination and rapid growth, although they do not prevent the invasion of the seedling, will often result in the production of normal panicles.

The fact that apparently healthy oat plants with normal panicles were found to contain the mycelium of the smuts in the lower portion of their stems (usually confined to the first, but occasionally reaching the second and third nodes), leads to the important conclusion that smutted panicles cannot be considered as a criterion for infection, unless tests are made under conditions where absolute control of environmental conditions is maintained throughout the entire development of the host. This throws considerable doubt on the value of certain existing data on varietal susceptibility of oats to smuts, and it is recommended that all future work in this respect should be checked by inoculating oats in accordance with the manner in which infection occurs in nature, as indicated above.

The results of his work lead the author to consider that the oat smut pathogens should be removed from the group causing seedling infection and placed in the flower infection group. Since, however, they differ from the fungi now included in the latter group in that the embryo is not invaded, he suggests that this group should be subdivided into an 'embryo infection' and a 'pericarp infection' group, the oat smut pathogens being placed in the latter.

NISIKADO (Y.) & MIYAKE (C.). **Studies on the uspulun treatment of cereal seeds against the Helminthosporioses.**—*Agric. Studies*, xi, pp. 36–64, 1927. (Japanese). [Abs. in *Japanese Journ. of Botany*, iv, 1, pp. (19)–(20), 1928.]

Studies were made on the fungicidal effect of uspulun solutions of varying strength, used for periods of varying duration, on the conidia of *Helminthosporium oryzae* from rice and *H. gramineum* from barley [*R.A.M.*, vi, pp. 54, 55]. The effects of uspulun treatment on the germination of rice and barley seeds were also studied in various combinations of strength and temperature of the solution and duration of exposure. Field experiments were also carried out for three years after the treatment of barley seed-grain against stripe disease caused by *H. gramineum*. Helminthosporiosis of rice caused by *H. oryzae* was found to be well controlled by treatment with comparatively dilute solutions of uspulun (1 in 800 to 1 in 1,200) for 48 hours at about 20° C., while stripe disease of barley was practically eliminated by 12 to 24 hours' immersion in a 1 in 800 solution at 10°.

ROBERTSON (J.) & ASHBY (H. T.). **Ergot poisoning among Rye bread consumers.**—*Brit. Med. Journ.*, 3503, pp. 302–303, 1928.

For the last 18 months the writers have observed an increasing prevalence of ergot poisoning among the Jewish population of Manchester, due to the consumption of rye bread contaminated by *Claviceps purpurea.* The symptoms of ergotism, which in this case were most acute in elderly foreign-born individuals, are described, and some observations are made on the mode of infection of the grain and the subsequent effect on the flour. It is estimated that ½ lb. of the contaminated rye bread (the average daily ration per head) contained 22·85 grains of ergot, or rather more than the usual medicinal dose. The symptoms were immediately relieved by stopping the consumption of the infected bread.

PFEIL UND KLEIN-ELLGUTH (H. A. Graf v.). **Beitrag zur Kenntnis der Roggenfusariose.** [Contributions to the knowledge of the Rye fusariosis.]—*Centralbl. für Bakt.*, Ab. 2, lxxiii, 15–23, pp. 347–373, 1 pl., 1 graph, 1928.

During the winter of 1923–4 the fusariosis of rye, associated with *Fusarium herbarum*, *F. avenaceum*, *F. culmorum*, and *F. nivale* [*Calonectria graminicola*], was responsible for heavier losses in Germany than any experienced for twenty years [*R.A.M.*, iv, p. 161; v, p. 85]. *F. herbarum* was present in more than half of the author's isolations, followed by the other species in the order given. Extensive observations in Upper Silesia showed that in many cases thorough disinfection of the seed-grain failed to control these organisms, indicating that soil infection is an important factor in the development of winter injury.

The infection of the grain was found to be greatly favoured by excessively heavy rain after flowering, especially during June. The attacks of *Fusarium* may produce a red coloration of the grain, but this cannot be taken as an infallible symptom of infection, since it may arise from other causes.

The germination of winter rye was found to be unimpaired by *Fusarium* infection, but the vigour of the seedlings decreases with a progressive intensity of infection.

The control of rye fusariosis by the selection of immune varieties, though theoretically possible, has hitherto met with no practical success.

REDDY (C. S.) & HOLBERT (J. R.). **Further experiments with seed treatments for Sweet-Corn diseases.**—*Journ. Agric. Res.*, xxxvi, 3, pp. 237–247, 1 fig., 1 diag., 3 graphs, 1928.

After preliminary greenhouse tests [details of which are given] had shown that seed treatment with any of several organic mercury compounds considerably reduced infection of maize by seedling blight (*Diplodia zeae*) [*R.A.M.*, vi, p. 157; vii, p. 440], a field experiment was conducted at the Arlington Experiment Farm, Virginia, in which *Diplodia*-infected sweet maize was dusted at the rate of 2 oz. per bushel with S.F.A. 225 dust (Saccharin-Fabrik A.-G., Magdeburg, Germany) and planted at different dates, the earliest being under unfavourable conditions of soil moisture and soil tem-

perature for maize. In the plot sown on 6th April, 1926, the treated seed gave an increase in yield per acre over the untreated seed of 126·4 per cent., while the figures for the plots sown on 14th and 22nd April and 7th May were 58·3, 66·8, and 82·9 per cent. increase, respectively. The total yield from the treated seed in the earliest plot approximately equalled that from the treated seed in each of the later plots, while the yield of prime canning maize was higher than that from the untreated seed in any plot. These results indicate that dust-treated sweet maize seed can remain longer in cold soils without injury than untreated seed.

Two lots of commercial sweet maize seed, one being nearly disease-free and the other 20 per cent. infected, were treated with various organic mercury compounds [a list of which is given], and planted in a field near Bloomington, Illinois. With the better seed, the average increase in yield of the treated over the untreated seed was 10·2 per cent., while in the poorer quality seed it was 31·3 per cent. In the former lot the two best results were given by semesan jr. dust (2 oz. per bushel), which gave 18·9 per cent. increased yield over the untreated seed, and by 1½ hours' immersion in 0·5 per cent. uspulun, which gave 22·1 per cent. increase. With the poorer quality seed the best results were given by semesan jr. dust (46·5 per cent. increase) and immersion in 0·5 per cent. semesan solution (45·9 per cent. increase).

Dust treatments gave more consistently beneficial results than did the liquid treatments.

JOHANN (HELEN). **Penicillium injury to Corn seedlings.**—*Phytopath.*, xviii, 2, pp. 239–242, 1928.

In seed-maize germination tests made at Wisconsin University in the spring of 1927, *Penicillium* spp. frequently appeared to be causing injury to the seedlings, the greatest reduction of stand occurring at 24° and 28° C. In parallel inoculations with *Fusarium moniliforme* [*Gibberella moniliformis*], *Trichoderma* sp., and a green *Penicillium* that was the species most frequently isolated, the last-named was the only organism producing consistent injury. Some seedlings reached the fourth or fifth leaf stage before death took place. Infection originated in the region of the embryo and proceeded up the mesocotyl. The hyphae were both inter- and intracellular and the parenchyma and vascular elements were invaded. The cells were apparently killed in advance of the mycelium, possibly by the oxalic acid produced in abundance by the fungus, which is stated to resemble *P. oxalicum* Currie and Thom.

JOHNSTON (C. O.) & MELCHERS (L. E.). **The control of Sorghum kernel smut and the effect of seed treatments on vitality of Sorghum seed.**—*Kansas Agric. Exper. Stat. Tech. Bull.* 22, 37 pp., 1928.

A full account is given of a comprehensive series of investigations into the control of kernel smut of sorghum (*Sphacelotheca sorghi*) [*R.A.M.*, vi, p. 414] carried out by the authors in Kansas, from 1918 to 1925. Briefly summarized, the results [which are tabulated] are as follows.

The dry formaldehyde treatment [ibid., v, p. 414] proved less effective than the soaking method, and is considered unsuitable for general use. Soaking for 30 minutes in a 1 in 240 formaldehyde solution, followed by immediate sowing, is considered safe, though liable to reduce germination somewhat, but stronger solutions caused greater seed injury.

Solutions of the commercial compounds chlorophol, corona 620, semesan, pythal, kalimat, and uspulun gave good results with less seed injury than resulted from the 1 in 240 formaldehyde treatment. Soaking mature seed in a strong solution (3 per cent.) of copper sulphate gave excellent control, with very little seed injury.

In general, dust treatments appeared more promising than the commercial solutions, as they caused no appreciable reduction in the vitality of the seed and were much more easily applied. Copper carbonate (2 to 4 oz. per bushel of seed) gave good control without injury, while excellent results were also obtained with dehydrated copper sulphate, Dosch copper-lime, flowers of sulphur, and corona 40 S and 640. Sulphur dusts, which cost much less than the copper carbonate, gave nearly as good control.

In all the treatments, seed injury depended on the physical condition of the seed.

Tests under farm conditions showed that copper carbonate dust invariably gave control as good as or better than that given by the formaldehyde treatment. Only one plot treated with copper carbonate showed more than a trace of smut, while the control plots had 3 to 30 per cent. infection. In some of the copper carbonate treated plots the stands were 20 to 50 per cent. better than those in the untreated controls. Where the seed contained few smut balls the copper carbonate gave perfect control; where there were more than 20 per cent. of smut balls it reduced infection to 4 or 5 per cent. This method has accordingly become very popular, and is recommended for general farm use.

Savoff (C.). Опитъ за борба съ праховитата главня по Мохара (лудого Просо)—**Ustilago crameri Körn.** [Experiments in the control of loose smut of Millet, *Ustilago crameri* Körn.]—*Rev. Inst. des Recherches Agron. en Bulgarie*, iv, 3, pp. 91–99, 1928. [French summary.]

The experiments in the control of loose smut (*Ustilago crameri*) of millet [*Setaria italica*; *R.A.M.*, vii, p. 238], details of which are given in this paper, were made in 1925 at the State Agricultural Experiment Station in Sofia [Bulgaria]. The fungicides tested were: 1 and 0·5 per cent. solutions of copper sulphate applied for 5 minutes and 1 hour, respectively; 0·2 per cent. tillantin B solution for one hour; 0·25 per cent. germisan solution for one hour; 1 per cent. segetan 104 B solution for one hour, and 0·25 per cent. uspulun solution for 1, 4, and 6 hours. The best results, both from the point of view of control of the smut and from that of least injury to germinability of the seed, were obtained by steeping the seed for one hour in a 0·25 per cent. solution of either germisan or uspulun.

STANFORD (H.). **Psorosis or scaly bark of Orange trees.**—*California Citrograph*, xiii, 4, pp. 112, 136, 7 figs., 1928.

Tests of different treatments for the control of psorosis or scaly bark of orange trees [*R.A.M.*, v, p. 297], begun in 1924 upon 142 affected trees at Ontario, California, where infection reaches 50 per cent. in some groves, indicated, three years later, that a medium scraping of the diseased bark (i. e., about half-way through) followed by an application of Bordeaux paste gave better results than similar treatment in which the scraping was either lighter or deeper. Scraping not followed by the application of any fungicide gave 53 and 28 per cent. control after two and three years, respectively, and is not considered reliable. Unscraped, diseased areas treated with different fungicides showed no improvement after one year. Tests made after scraping to a uniform depth with the following fungicides: lime-sulphur, atomic sulphur, a carbolineum compound of cresol composition, carbolineum, kreso, liquid cresolis compositus, 2 per cent. formalin, and a mixture of mercuric cyanide and mercuric chloride (both at 1 part in 500 parts of water) showed that the best control was given by the lime-sulphur, carbolineum, and atomic sulphur, with 81, 67, and 61 per cent. success, respectively, and this in spite of the fact that both the sulphur-treated plots consisted of top-worked trees, which are notoriously the most susceptible to psorosis.

The author points out that, after one year, bark renewal was not so far advanced in the sulphur-treated trees as in some of the others, so that this is not a prime factor in control; on the other hand, since those materials (except formalin, which came fourth in order of merit, with 46 per cent. control) which did not produce any marked effect on the bark also failed to give efficient control, renewal may be a contributing factor.

Carbolineum should be tested for bark injury (burning) before being applied.

SHERBAKOFF (C. D.). **Washingtonia Palm leaf spot due to Cylindrocladium macrosporium n. sp.**—*Phytopath.*, xviii, 2, pp. 219–225, 2 figs., 1928.

In 1916 and again in 1919 the leaves of *Washingtonia robusta* in Florida were found to be covered with spherical to oblong, dark greenish-brown spots, ranging from less than 0·5 to over 2 mm. in diameter. The causal organism, the parasitism of which was established by inoculation, was identified as a species of *Cylindrocladium* differing from *C. scoparium* on *Gleditschia triacanthus*, and *C. parvum* on rose, clover, and apple, in its larger conidia (102·5 by 5·2 μ in the strain from seedling leaves and up to 83 by 5·25 μ in that from mature palms, compared with 45 by 4·2 and 17 by 2·5 μ), as well as in other morphological and physiological characters. It is named *C. macrosporium* n. sp. and described in English.

FERNANDES (D. S.). **Voorloopige mededeeling over de oorzaak van de zeefvatenziekte (phloeemnecrose) bij de Liberiakoffie en hare bestrijding.** [Preliminary note on the cause of the sieve-tube disease (phloem necrosis) of Liberian Coffee and its

control.]—*Meded. Landbouwproefstat. Suriname* 2, 12 pp., 1928.

Phloem necrosis of Liberian coffee bushes in Surinam [*R.A.M.*, v, p. 346] has been found to be due to the dislocation of the food transport through the bast, the starch and fat (which in coffee leaves is normally formed along with starch as a result of assimilation) being retained in the parenchyma and medullary rays instead of undergoing the normal assimilatory processes. It was experimentally shown that in roots growing in badly aerated soil only the starch was made use of for this growth, the fat remaining behind in the bast. This disorganization in the passage of the nutrient elements has been experimentally induced in trees growing on badly aerated soils in the 'polders' [land reclaimed from the sea], where the oxygen supply is inadequate and the roots are unable to develop normally owing to the impermeability of the ground. Each successive development of roots arises closer to the surface of the soil, and eventually a slender network is formed approximately at soil level. Such trees are exposed to the loss of their roots several times a year, the superficial ones succumbing during the dry season and the deeper roots dying back in wet periods as an outcome of waterlogging. The results of experiments with coffee seedlings in water cultures showed that defective aeration leads to a cessation of growth in the root system, and eventually to a disturbance of the leaf functions involving chronic wilting. It is this last phenomenon, rather than the relatively slight degree of phloem necrosis, which is actually responsible for the death of coffee trees on badly aerated soils.

Phloem necrosis was further induced in a number of five-year-old coffee trees by making incisions in the bark down to the wood at various places in the stem, thus interrupting the transport of food and causing a more or less pronounced gumming of the sieve-tubes, especially those situated above the wound, which lasted until callus formation over the wound set in. The effects of a similar operation performed after defoliation were scarcely noticeable, showing that the passage of food must be actively in progress at the time of wounding in order to produce a disorganization of the phloem. Similar symptoms were induced by incisions in the bark of citrus and guava, but cacao failed to react to this treatment. Phloem necrosis, therefore, is evidently not restricted to coffee; a typical case was in fact observed on a 'knippa' [*Melicocca bijuga*] tree.

It is apparent from the results of these experiments that phloem necrosis may develop in consequence of various causes. Micro-organisms may penetrate the roots through wounds and destroy the inner bast in a circular or spiral direction. Direct injury to the roots and stems may also be inflicted by fungi or insects. The disease may further arise as a result of mechanical impediments to the development of the root system. No trace of parasitic organisms could be detected, and Stahel's experiments are stated to have shown that the condition is not caused by a virus.

The first indications of phloem necrosis may be detected during the transition period from the dry to the wet season, i.e., when the trees begin to make fresh root growth and food transport down the

tree becomes active. Sometimes the trees show no external symptoms of the disease, which in such cases assumes a purely temporary and innocuous character.

Phloem necrosis was experimentally induced in ten healthy eight-year-old coffee trees by pruning their roots and allowing only a restricted space for the development of new ones; and in five trees of the same age by pressing down the soil round the stems with heavy mallets, thereby causing injury to the roots and preventing the growth of new ones by consolidating the ground.

The measures suggested for the improvement of affected coffee plantations include thorough cultivation of the soil, the use of cover crops, and the application of lime in moderate quantities, care being taken not to produce a neutral or alkaline soil reaction, which is unfavourable to the health of the crop.

Reports received from Experimental Stations 1926–1927.—251 pp., 18 pl., 24 graphs, 2 maps, London, Empire Cotton Growing Corporation, 1928.

The following references of phytopathological interest occur in these reports. At the Candover Estates Experimental Station, Magut, Natal, all varieties of beans (*Phaseolus vulgaris*) grown as green manures were severely attacked by *Bacterium phaseoli*, *Nematospora* spp., and *Rhizoctonia*. The Yellow commercial variety of soy-beans succumbed completely to a *Fusarium* wilt, while all varieties of this crop were affected by a bacterial disease probably caused by *Bact. glycineum*.

At Sigatoka, Fiji, there was an outbreak of leaf spot of cotton (*Helminthosporium gossypii*) subsequent to excessive rains. Only one case of black arm (*Bact. malvacearum*) was recorded in the Sea Island plants at the experimental station throughout the season; the diseased plant was immediately burnt. Meade cotton was a complete failure, largely owing to internal boll rot (*Rhizopus nigricans*) [*R.A.M.*, vii, p. 97].

Massey (R. E.). **Work of the Section of Plant Physiology and Pathology.**—*Sudan Agric. Res. Repts., 1926–27*, pp. 120–142, 1 pl., 6 graphs, 1928.

The results of further investigations on the black arm disease of cotton (*Pseudomonas* [*Bacterium*] *malvacearum*), especially in connexion with the correlation between the rainfall at sowing and the development of infection, strongly support the data obtained in previous experiments [*R.A.M.*, vii, p. 95]. The parasite has been detected in the ovaries before fertilization, and the roots of some wilted plants recently submitted for examination were found to be visibly attacked. A considerable reduction in the incidence of black arm infection was obtained by several hours' exposure of the seed to a temperature of 100° C. after slow drying at 60°. Records received from Egypt show that the average soil temperature for at least a fortnight after sowing is about 17°, and this (taken in conjunction with previous data) [loc. cit.] is thought to explain the comparative immunity of Egyptian cotton from black arm. Egyptian seed, however, always produces a certain number of diseased plants when grown under suitable conditions. The

capacity of the causal organism to lie latent within the host has been strikingly demonstrated in the Gezira with Tokar seed.

Rhizoctonia [*Corticium*] *solani* has been isolated from 'wilted' cotton plants in the Gezira, and its pathogenicity proved by inoculation experiments. The fungus attacks both Egyptian and American cotton and is also found on lubia (*Dolichos lablab*), the last-named host being most severely attacked at a soil temperature of 18° to 20°, with a reduction of infection at 22° and immunity above 27°. In practice it has been found that warm, dry soil acts as an effective check to the disease, which appears to be generally distributed throughout the Sudan.

A thickening and curling of the leaf tissues, similar to the leaf curl reported from Nigeria [ibid., vii, p. 317], has been observed on cotton in the Gezira and elsewhere, and investigations on the etiology of this condition are in progress.

Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending August 31st, 1927.—116 pp., 11 pl., 1927. [Received March, 1928.]

This report contains (pp. 33–34) the following reference by Mr. B. C. Burt to wilt disease of cotton [*Fusarium vasinfectum*]. Grants have been made by the Indian Central Cotton Committee for the study of this disease—stated to be the only important affection of cotton in India—at Dharwar and Nagpur [*R.A.M.*, vii, p. 30]. This is described as 'perhaps the most baffling and difficult problem which has been undertaken', but in view of the heavy losses caused by the fungus over wide areas of black soil, further investigations appeared urgent. Some new strains of Kumpta cotton of good staple and high wilt resistance are stated to be now available. The determination of the thermal death point of *F. vasinfectum* [ibid., vi, p. 208] has indicated the possibility of control measures, field experiments to test the efficiency of which are in progress. Observations at Nagpur suggest that the wilt problem in the Oomras tract differs in certain aspects from that in the Kumpta cotton-growing region [see above, p. 492].

Buchner (P.). **Holznahrung und Symbiose.** [Wood nutrition and symbiosis.]—64 pp., 22 figs., Berlin, J. Springer, 1928.

In this lecture, delivered before the tenth International Zoological Congress at Budapest on 8th September, 1927, the symbiotic relations between insects and fungi are fully discussed.

It is now known that all sap-sucking insects, Homoptera as well as Heteroptera, are symbiont bearers. In addition to the Atta ants and the Termites, which cultivate fungi on leaf or wood media of their own preparation, the wood-inhabiting bark beetles (e.g., *Xyleborus dispar*) are also engaged in fungus cultivation by a different method. In this case the insect gallery forms the substratum for a fungus (the ambrosia-fungus) which converts it into a highly nutritious food store for the insect symbiont. Each species cultivates its own fungus, presumably in every case an Endomycete. The beetle *Hylecoetus dermestoides*, which is closely allied to the bark beetles in its mode of life, also cultivates in its galleries

a fungus with a luxuriant septate mycelium and elongated sporangia (found only in the pupal stage) very reminiscent of *Dipodascus*, the sole known representative of the Dipodascaceae, a sub-family of the Endomycetales. The female imago of *H. dermestoides* is provided with special organs containing the round, thick-walled spores, which are distributed over the surface of each egg. The exact means whereby these organs are filled with the spores has not been investigated. Special contrivances of a similar nature were found by the author in wood wasps (Siricidae), represented by *Sirex juvencus*, *S. gigas*, and *Xiphydria longicollis*. The fungus cultivated by these insects is a typical Basidiomycete with clamp-connexions. The mycelium is less profuse than that found with *H. dermestoides* and the bark beetles, and this suggests that the insect is less dependent on the substance of the fungus than on the enzymes absorbed with the mycelium, which loosen the compounds of the wood.

In the Anobiidae and Cerambycidae the yeast-like symbionts (probably Saccharomycetes) are contained in the middle intestine.

Notes are also given on the symbiotic relations between certain Termites and their polymastiginous flagellates, and between various other insects and the bacteria uniformly found in their internal organs. The function of the fungous or bacterial symbiont in all these cases would appear to consist in an expansion of the insect's normal powers in rendering available supplies of special sources of nutriment.

NYE (R. N.), ZERFAS (L. G.), & CORNWELL (M. AGNES). **The presence and importance of yeastlike fungi in the gastro-intestinal tract in pernicious anemia, in other diseases and in normal individuals.**—*Amer. Journ. Med. Sci.*, clxxv, 2, pp. 153–174, 1928.

Seventy-eight strains of yeast-like fungi were isolated in pure culture from the gastro-intestinal tract of a number of persons suffering from pernicious anaemia and other diseases, and of normal individuals. By far the majority of these strains have been placed, on the basis of morphological and cultural similarities, in the single species group, *Parasaccharomyces* A. The members of this large group are stated to be indistinguishable from named strains of *Monilia psilosis* [*R.A.M.*, vi, p. 726] or from yeast-like fungi isolated from typical thrush membranes or sputum, and are apparently of common occurrence in the human gastro-intestinal tract. The percentage isolations of *Parasaccharomyces* A in cases of pernicious anaemia were no greater than in those of severe anaemia and gastric achylia. On the basis of these observations it is considered probable that *M. psilosis* is unimportant as an etiological factor both in pernicious anaemia and sprue.

T. (F. E.). **Cutaneous moniliases.**—*Journ. Trop. Med. and Hygiene*, xxxi, 3, pp. 37–38, 1928.

This is a brief review of the current literature on blastomycosis associated with *Cryptococcus*, *Saccharomyces*, *Coccidioides*, and *Monilia* [*Candida*].

Castellani (A.). **Notes on blastomycosis: its aetiology and clinical varieties.**—*Proc. Roy. Soc. of Med., Sect. Trop. Dis. and Parasitology*, xxi, 3, pp. 447–462, 10 figs., 1928.

This is a comprehensive survey of the writer's observations on the etiology of blastomycosis cutis, of which six clinical types are distinguished. The cultural and biochemical characters of the various fungi involved in these conditions are described (and tabulated in the case of *Monilia* [*Candida*] spp.), while a number of illustrative cases are cited. The author suggests the creation of a new temporary genus, *Blastomycoides*, represented by the species *B. dermatitidis* Gilchrist, *B. tulanensis* Cast., and *B. immitis* Gilchrist, as a substitute for *Blastomyces*, a name which is stated to be untenable for these organisms on botanical grounds.

Da Matta (A.). **Sterigmatocystis tropicalis n. sp. de fungo patogenico para o homem.** [*Sterigmatocystis tropicalis*, a new species of fungus pathogenic to man.]—*Bol. Inst. Brasil. Sci.*, iii, 3, pp. 51–54, 1 pl., 1928.

From an ulcer on the foot of a native of Brazil the author isolated a species of *Sterigmatocystis* [*Aspergillus*] of the section *versicolores*, resembling *S. tunetana* [*R.A.M.*, iii, p. 597], for which the name *S. tropicalis* n. sp. is proposed [without a diagnosis].

Hiratsuka (N.). **Studies on the Flax rust.**—Reprinted from *Trans. Sapporo Nat. Hist. Soc.*, x, 1, 27 pp., 1928. [Japanese summary.]

Flax rust (*Melampsora liniperda*) [*M. lini*: *R.A.M.*, vi, p. 358] is stated to be widely distributed in the flax-growing regions of Japan, where it was first observed in 1906 on *Linum stelleroides*. It was not observed on cultivated flax until 1911, and in 1914 became a serious disease for the first time.

After many attempts to secure germination of the teleutospores, the writer eventually obtained positive results [which are described] with overwintered teleutosori collected in April, 1925. The sporidia give rise to spermagonia in 6 to 12 days, followed by aecidia, on the stems, cotyledons, and true leaves of flax seedlings. The first uredosori develop from the same mycelium that bears aecidia, and appear about six days after the latter.

The oval or ellipsoid, very thin-walled spermatia, measuring 3·2 to 5·4 by 2·2 to 4·6 μ, are produced in spermagonia (developing on both sides of the leaves and occasionally on the stem) on septate, branching spermatiophores, while the orange-yellow, round or oblong aecidia, which are of the *Caeoma* type, are mostly scattered on the under surface of the cotyledons and foliage leaves. The globose, ellipsoid, or polygonal aecidiospores, containing yellowish-orange pigment, measure 17·6 to 27·2 by 16·2 to 24 μ, and have a colourless, thin, verrucose epispore, without distinct germ-pores.

The results of inoculation experiments [which are described and tabulated] on 89 varieties or strains of flax from various sources, both in the greenhouse and out-of-doors, showed that the incubation period of the uredospores from Pernau flax, from the time of inoculation of either aecidiospores or uredospores till the appear-

ance of new uredosori, varied between 7 and 12 days, the average period being 9 days.

The following varieties and strains of seed flax [linseed] were found to be highly resistant to, or immune from, flax rust: Argentine from Henry [loc. cit.], Argentine selection from Dillman (North Dakota), Belgium (seed), Cayagneo (Dillman), Ottawa 770 B from Robinson (Minnesota), and Williston Golden (Dillman). The so-called Argentine variety from the Hokkaido Agricultural Experiment Station and the Teikoku Seima Kaisha proved susceptible, as did a number of other strains and varieties of seed and fibre flax, including Saginaw, Washington Nos. 7 and 14, Pernau, Blue and White Blossom Dutch, Yorkshire, London (seed), Russian, Tientsin, Holland No. 12, Siberia D, Canadian White Dutch, Minnesota, Normandy, Abyssinia, Burbank, Mandan, and several Danish and Irish pure lines.

Atkins (W. R. G.). **The preservation of fishing nets by treatment with copper soaps and other substances.**—*Journ. Marine Biol. Lab.*, Plymouth, N.S., xv, 1, pp. 219–235, 1928.

Under the conditions of the author's experiments [which are described], cotton and hemp fishing nets became rotten through bacterial fermentation in aquarium tank water in two months or less during the summer, and in 4½ to 5½ months in winter [*R.A.M.*, vi, p. 728; vii, p. 171].

A mixed copper soap, containing oleate, stearate, and palmitate, was found to be as good as, if not better than, copper oleate as a net preservative. 'Cuprinol', a mixture of 50 parts of the copper salts of crude acids separated from Russian or Galician petroleum, dissolved in 36 parts of volatile petroleum (boiling range 85° to 250° with 14 parts of heavy mineral oil), proved superior to the fatty acid soaps, both in fresh and salt water. It is, however, more than three times as expensive, the approximate cost of treatment being one shilling per kg. of net. This preparation is supplied by Aktieselskabet Kymeia, Glentevej 61, Copenhagen.

The following specially good results were obtained in these tests. Mixed fatty acid copper soap, 1 lb., with 1 lb. of coal tar or antifouling paint (a red copper oxide preparation supplied by Messrs. Foster, Mason, and Harvey), in 1 gall. petrol, hemp nets about half strength, cotton nets full strength, sound after 26 months. Also copper soap 1 lb. to 1 gall., followed by a dip in copper soap 1 lb., resin 1 lb., petrol 1 gall., hemp and cotton nets about half strength, sound after 20 months. The untreated controls perished in 2½ and 2 months, respectively. In this series cutch (a 2 per cent. infusion of the tannin extract) and Olie's (Dutch) method, consisting of the cutch treatment followed by immersion in a 1 per cent. solution of copper sulphate with the addition of 4 c.c. of strong (sp. gr. 0·88) ammonia solution per l., were satisfactory for hemp (half strength sound after 20 months) but less so for cotton (only 5 months). Olie's treatment, however, was also successful with cotton at two subsequent repetitions.

The results of these experiments [which are tabulated and discussed] are considered to indicate that by far the best initial treatment for fishing nets is one with copper soap reinforced by anti-

fouling paint or coal tar. Both for shrinking the knots and for preservation a preliminary cutching would seem to be advantageous. It is, however, questionable whether repeated applications of Olie's ammoniacal copper sulphate are not preferable on the grounds of economy, simplicity, and rapidity.

BRYAN (MARY K.). **Lilac blight in the United States.**—*Journ. Agric. Res.*, xxxvi, 3, pp. 225–235, 5 pl., 1928.

Lilac blight (*Pseudomonas syringae*) [*R.A.M.*, vii, p. 246] was first reported in the United States in 1925, when cultures from blighted lilac twigs sent from Illinois gave colonies resembling *P. syringae*, when compared with a strain of the latter isolated from diseased lilac from Holland, except that they were wrinkled instead of smooth. The symptoms of the disease in Illinois [which are fully described] agree with those observed on the continent of Europe, but not with Güssow's account of lilac blight in England (*Gard. Chron.*, Ser. II, xliv, p. 404, 1908). Güssow does not mention stem or petiole infections, and the symptoms on the leaf blades as he describes them are stated to be unlike those of the Dutch and American forms of the disease.

Referring to Smith's investigations on *P. citriputeale* [loc. cit.], the author states that a freshly isolated culture of this organism obtained from California was identical with *P. syringae* except that slight differences, not more marked than those between the Dutch and Illinois strains, were observed in the colony characters on agar. Successful inoculations of lilac were made with *P. citriputeale*, and black pit lesions were produced on lemons by needle prick inoculations with the Dutch and Illinois strains of *P. syringae*, though these strains were somewhat less virulent on lemons than the Californian strain. The lilac blight reported from California is, therefore, probably identical with that found in Europe and Illinois.

Successful cross-inoculations [details of which are given] were also made with the Dutch and Illinois strains of *P. syringae*. When used to inoculate lilacs in the greenhouse both strains produced identical results, except that the Dutch strain seemed slightly the more virulent.

The disease, which the author considers was probably introduced from Europe on nursery stock, was observed in the nursery on the following purple and white varieties of lilac: Mont Blanc, Reine Elizabeth, Princess Alexandra, and Roi Albert.

The paper terminates with a detailed description of the cultural and physiological characters of the organism.

SCHMIDT (E.). **Winke zur Bekämpfung des Vermehrungspilzes.** [Hints on the control of the propagation fungus.]—*Gartenwelt*, xxxii, 6, p. 76, 1928.

The occurrence of the propagation fungus [*Moniliopsis aderholdi*] in begonia and other leaf cuttings and suckers [*R.A.M.*, vi, p. 359] is stated to be favoured by the use of young, insufficiently rotted and aerated leaf mould, which should be replaced by old, well-rotted mould with a plentiful admixture of peat and sand. Other measures for the control of this organism include regular renewal

of the soil in the propagation-beds, spraying the new soil with 1 per cent. uspulun, and frames, &c., with a 4 per cent. solution of the same preparation or of Bordeaux mixture, and the sprinkling with 0·25 per cent. uspulun of the newly-planted seedlings of chrysanthemum, hydrangea, and the like. Diseased plants should be removed and destroyed immediately.

RATH (E.). **Zur Bekämpfung des Vermehrungspilzes.** [On the control of the propagation fungus.]—*Gartenwelt*, xxxii, 10, p. 130, 1928.

In connexion with the control of the propagation fungus [*Moniliopsis aderholdi*] in seed-beds [see preceding abstract], the writer states that uspulun (40 gm. in 10 l. of water per cu. m.) is now extensively used for sterilization of the soil. Formaldehyde is said to be widely employed abroad for the same purpose. Carbon disulphide has been largely superseded on account of its inflammability.

PAPE (H.). **Eine Begleiterscheinung bei der Kräuselkrankheit der Pelargonien.** [A phenomenon accompanying the curl disease of *Pelargonium*.]—*Gartenwelt*, xxxii, 9, pp. 116–117, 2 figs., 1928.

Attention is drawn to certain manifestations which frequently accompany leaf curl of *Pelargonium* [*R.A.M.*, vi, pp. 728, 729]. Some affected plants show a variegation or mottling of the foliage and striking morphological changes in the leaf blade. In numerous cases the leaf surface is covered with minute, pale spots and transparent, slender lines, while raised blisters appear on the under side.

BRYAN (MARY K.). **Verticillium wilt of Heliotrope.**—*Phytopath.*, xviii, 2, p. 246, 1928.

Heliotrope [*Heliotropium peruvianum*] plants growing at Washington, D.C., were observed in the autumn of 1925 to show a black shrivelling and wilting of the leaves and blossom clusters. Most of the stems were almost entirely brown. The vascular region was somewhat discoloured and the mycelium of a species of *Verticillium* agreeing with *V. albo-atrum* was present both in the cortex and wood. Inoculation experiments with this fungus on potted heliotrope plants in the greenhouse gave positive results. *V. albo-atrum* has apparently not hitherto been recorded on this host. The disease recurred in 1926 and 1927.

WHETZEL (H. H.). **The crown elongation disease of the Peony.**—*Phytopath.*, xviii, 2, pp. 243–244, 1 fig., 1928.

In September, 1925, and again during the same month of 1927, the writer examined some peony roots, mostly of the Darkness variety, showing a marked elongation of the crowns with small, weak buds at the tips. The elongated crowns produce numerous secondary shoots from adventitious buds along their sides, giving the general effect of a witches' broom. In the spring the buds from diseased crowns send up slender, weak shoots which seldom

reach a height of more than five or six inches, with small, dwarfed foliage and no flower buds. No causal organism has been isolated from the affected roots, but the disease is thought to be on the increase in the Middle West, and the prompt eradication of suspected individuals is advisable.

DOSDALL (LOUISE). **A mosaic disease of Gladiolus.**—*Phytopath.*, xviii, 2, pp. 215–217, 2 pl., 1928.

Several gladiolus corms of the Primulinus hybrid variety were found in 1925 to exhibit a peculiar deformed appearance characterized by wartiness and a mottled yellowish-green coloration. The leaves developing from the affected corms were abnormally thick and stiff and showed a mottling similar to that of mosaic sugarcane leaves. Later, other varieties were found similarly affected. In an experiment conducted in the spring of 1926, mostly with corms of the Gretchen Zang variety, only 48 per cent. of the warted individuals produced blossoms, compared with 95 per cent. of the controls. The plants from warty corms blossomed considerably earlier than the others. In many cases the mottling was very prominent on the peduncle and bracts of the inflorescence, while the normal pink colour of the petals was broken with greenish-white. The peduncles were shortened and the blossoms bunched. There was a considerable reduction in the yield of cormels from diseased plants, and the disease, which is regarded as a typical 'degeneration disease', was transmitted through the corms, eventually killing the plants. Observations indicate that the cotton aphid (*Aphis gossypii*) may be a vector.

PAPE (H.). **Das Umfallen der Tulpen in der Treiberei.** [The collapse of hothouse Tulips.]—*Gartenwelt*, xxxii, 14, pp. 185–186; 16, pp. 215–216, 1 fig., 1928.

Numerous complaints have been received from German nurserymen concerning the sudden collapse of apparently perfectly healthy tulips, chiefly of the pale, early varieties, e.g., Murillo, Rose Grisdelin, and Prinz von Oesterreich. Water soaked lesions, 1 to 2 cm. in length, appear on the floral shoots close to the insertion point of the lowest, oldest leaf or of one of the upper leaves. At the seat of the lesion the stalk collapses, the remainder of the plant being entirely normal. A number of suggestions have been made as to the cause of the disease, which is attributed to various unfavourable environmental conditions, such as insufficient ripening of the bulbs due to cool, damp, summer weather; cultivation in clay soil; excessive heat during forcing; and the like. A similar disease in the United States has been ascribed to *Phytophthora cactorum*, but according to Schenk [*R.A.M.*, v, p. 492] no conclusive proof of the parasitic nature of the collapse is forthcoming. The present writer also found no trace of fungous infection.

CHAUDHURI (H.). **Annual partial wilting in Hibiscus tiliaceus.**—*Journ. Indian Bot. Soc.*, vi, 3–4, pp. 109–112, 1927. [Issued 1928].

The newly-formed twigs of some plants of *Hibiscus tiliaceus* at

Lahore (Punjab) showed a temporary wilting during the spring and early summer for several consecutive years. The young buds and leaves became flaccid, and in extreme cases the young branches also withered and dried up. The disease was found to be due to *Alternaria dianthi*, which also causes heavy losses from bud rot in *Jasminum* and marigold beds. The fungus normally remains within the host tissues but sometimes appears on the leaf surfaces, causing spots the centres of which may drop out. Morphologically the strain occurring on *H. tiliaceus* resembles that on the other hosts, but considerable physiological differences were observed. The strain from *Jasminum* and marigold failed to infect *H. tiliaceus*, whereas inoculation tests with *A. dianthi* from the latter host gave positive results on the other two. The *Hibiscus* strain produces an abundant alkaline secretion in culture and this, rather than vascular obstruction by the hyphae, has been shown to be the actual cause of the wilting. The spores are killed by ten minutes' exposure to a temperature of 42° C. It is suggested that the fungus persists within the host tissue during the period of high summer temperatures.

Proytchoff (G. G.). Генетични изследвания върху устойчивостьта на ръждата при тревата Тимотейка—**Phleum pratense L.** [Genetic investigation of the resistance to rust of Timothy grass—*Phleum pratense* L.]—*Rev. Inst. des Recherches Agron. en Bulgarie*, iv, 3, pp. 1–24, 4 pl., 1928. [English summary.]

This is a detailed report of the author's work in 1925 at the Minnesota Agricultural Experiment Station in the United States, in continuation of Barker's and Hayes's investigation of the question of resistance to rust (*Puccinia* [*graminis*] *phleipratensis*) in Timothy grass (*Phleum pratense*) [*R.A.M.*, iv, p. 30]. He studied under greenhouse conditions the inheritance of resistance or susceptibility to the rust in 133 self-fertilized lines of Timothy grass, and his results confirmed those already obtained in previous investigations, namely, that selection of self-fertilized lines of this plant is a practical means of freeing them from undesirable recessive characters and of isolating superior varieties in yielding capacity and rust resistance.

The 133 lines studied exhibited considerable differences in rust resistance, ranging from complete susceptibility (in 10 lines) to very high resistance (in 29 lines). Sixty-one lines were heterozygous, with resistance as a dominant. Correlating the reaction of the parent plants in the field with the reaction of their progeny under the experimental conditions, it was found that those which were susceptible in the field produced susceptible descendants, while plants resistant in the field, with few exceptions, bred true for resistance or produced both resistant and susceptible plants. In the author's opinion, these results can be explained on the basis of a single genetic factor pair which conditions resistance and susceptibility. There was some evidence of modifying factors which influence the degree of resistance or susceptibility, but the nature and number of such factors was not determined.

NISIKADO (Y.). **Leaf blight of Eragrostis major Host. caused by Ophiobolus kusanoi n.sp., the ascigerous stage of a Helminthosporium.**—*Japanese Journ. of Botany*, iv, 1, pp. 99–112, 5 pl., 1928.

The results are described of the author's morphological studies on a species of *Helminthosporium* found infecting *Eragrostis major* in June, 1924, and on its perfect stage, which belongs to the genus *Ophiobolus*, and is sometimes found on the dead parts of the host. The leaves of affected plants show water soaked, later greyish-brown, yellow-bordered lesions, about 1 mm. in width and 10 to 15 or occasionally over 30 mm. in length, generally oblong and truncate at both ends. The diseased leaves shrivel from the tip downwards. The leaf sheaths, ears, and glumes of the grass are also attacked.

In monosporous pure cultures from conidia and ascospores on rice agar the production of both spore forms was observed, thereby proving the genetic connexion between the two stages.

The relatively short, obclavate, 3–4-septate, dark olive conidia, measuring $44{\cdot}89 \pm 0{\cdot}11$ by $14{\cdot}90 \pm 0{\cdot}03\,\mu$, resemble those of *H. eragrostidis* P. Henn., but no definite conclusion as to the identity of this stage is reached in the present paper.

The ascigerous stage of the fungus does not appear to have been previously described, and the name *O. kusanoi* n.sp. is proposed for it. The globose or subglobose, dark olive or black perithecia, with short, rostrate beaks and pseudoparenchymatous walls, measure 300 to 350 μ in diameter. The hyaline, thin-walled, cylindrical or long clavate, shortly stipitate asci, with round apices, measure 130 to 170 by 14 to 18 μ and contain eight hyaline, filamentous, thin-walled, 6- to 8-septate ascospores, 140 to 170 by 5 μ in diameter. The numerous hyaline, slender paraphyses are equal in length to the asci and 1·5 to 2 μ in width.

Inoculation experiments with a pure culture of this fungus gave positive results on *E. major* and *Eleusine indica*.

HOUGH (W. S.). **Orchard spraying and spray equipment.**—*Virginia Agric. Exper. Stat. Bull.* 260, 12 pp., 4 figs., 1928.

This bulletin embodies the results obtained at Winchester, Virginia, in orchard spraying experiments conducted over a period of four years with special reference to the control of injurious insects, but also applicable to the control of fungous diseases. It was found that the efficacy of the treatment to a very large extent depends on uniformity of application of the spray on all the parts of the trees, and detailed instructions are given to attain this end. Practical advice is also given as to the equipment best suited for orchards of various sizes, with some concrete examples in the form of tables.

RIKER (A. J.). **Notes on the crowngall situation in England, France and Holland.**—*Phytopath.*, xviii, 3, pp. 289–294, 1 fig., 1928.

The data obtained in connexion with a survey of representative nurseries in England, France, and Holland during the autumn of

1926 showed that crown gall of fruit trees (*Bacterium tumefaciens*) was very seldom of economic importance. In north-western France the disease was not observed in any of the orchards inspected. A limited number of wound overgrowth, callus, and hairy root malformations of a non-parasitic nature [*R.A.M.*, vii, p. 145] were found in all the countries visited. In general, the crown gall situation in these parts of Europe is very similar to that existing in the north-central and north-eastern United States.

STAPP (C.). **Der Wurzelkropf oder Bakterienkrebs der Obstbäume und seine Bekämpfung.** [Crown gall or bacterial cancer of fruit trees and its control.]—*Biol. Reichsanst. für Land- und Forstwirtsch., Flugbl.* 78, 4 pp., 3 figs., 1928.

This is a popular account of the symptoms, distribution, and control of crown gall of fruit trees (*Bacterium tumefaciens*).

POWELL (A.). **Cold storage in Australasia. Apple scald and wilt in cool storage fruit.**—*Fruit World of Australasia*, xxix, 2, p. 67, 1928.

This paper, read at the Victorian Cool Stores conference in January, 1928, explains the advantages that are gained in the control of scald (especially the type prevalent in Jonathan apples) [*R.A.M.*, iv, p. 552] and wilt of apples by keeping the storage chambers at a temperature of 28° or 29° F., with a daily rise of 3°. It is stated that growers should pay more attention to storing their fruit while it is cool, and as early in the day as possible, in order to avoid raising the temperature of the storage chamber.

In constructing a cool store the use of asbestos mill-board between the outside layers of wood is recommended.

BRAUN (K.). **Die Obstscheunen des 'Alten Landes' und ihre Schädlinge.** [The fruit storehouses of the 'Altes Land' and their pests.]—*Mitt. Gesellsch. Vorratsschutz*, iv, 1, pp. 5–6; 2, pp. 18–19, 1928.

The so-called 'Altes Land' (i.e., that portion of the Lower Elbe fruit-growing region situated in the district of Jork and extending along the left bank of the river from near Hamburg to the Schwinge estuary at Stade) produces considerable quantities of fruit, of which apples are the most important. Pending its sale in the Hamburg market the fruit is kept in specially constructed cool stores [particulars of which are given]. The chief fungous disease of apples in this district is scab (*Venturia inaequalis*), the development of which is favoured by the prevalence of moisture. All varieties appear to be more or less susceptible, and notwithstanding all precautions it is scarcely possible to avoid some development of the infection in storage. The scab spots are frequently the starting points for secondary fruit rotting fungi, which rapidly cause the decay of the apples. Other diseases of stored apples in the 'Altes Land' include yellow rot (the cause of which has not yet been determined), and black rot (*Sclerotinia fructigena*).

ENDÔ (S.). **On a Phomopsis disease of Japanese Pears. II Report.**—*Journ. Plant Protect.*, xiii, 8 pp., 1 pl., 1927. (*Japanese.*) [Abs. in *Japanese Journ. of Botany*, iv, 1, p. (1), 1928.]

The cultivation of Japanese pears [? *Pyrus serotina*: *R.A.M.*, v, p. 107] in the Department of Tottori is menaced by the invasion of a disease affecting the stems and branches of the trees, especially those above ten years old. Some differences in varietal susceptibility were observed. Infection was found to be due to a new species of *Phomopsis*, *P. fukushii* Tanaka & Endô. Culture, inoculation, and control experiments were conducted.

FAES (H.) & STAEHELIN (M.). **La maladie criblée du Cerisier (Clasterosporium carpophilum) et la tavelure (Fusicladium dendriticum-pirinum) des Pommes et Poires.** [Shot hole of the Cherry (*Clasterosporium carpophilum*) and scab (*Fusicladium dendriticum-pirinum*) of Apples and Pears.]—*Ann. Agric. de la Suisse*, xxix, 1, pp. 83–92, 1 fig., 1928.

Excellent control of shot hole of cherries (*Clasterosporium carpophilum*) was obtained at Lausanne and other places in the vicinity in 1927 by two applications of 1 per cent. Bordeaux mixture given (*a*) immediately the fruits began to form, and (*b*) a week later [*R.A.M.*, vi, p. 494]. Lime-sulphur proved less efficacious. The disease, which was widespread throughout the greater part of Switzerland, failed to develop in the very dry climate of Sion (central Valais).

Apple and pear scab (*Venturia*) [*inaequalis* and *V. pirina*] were well controlled by two applications (immediately before and after flowering) of 2 per cent. lime-sulphur Maag, plus 2 per cent. lead arsenate, which was also effective against *Monilia* [*Sclerotinia*] *fructigena*.

AMOS (J.) & HATTON (R. G.). **'Reversion' in Black Currants. II. Its incidence and spread in the field in relation to possible control measures.**—*Journ. Pomol. and Hort. Science*, vi, 4, pp. 282–295, 1 pl., 1928.

A detailed account is given of seven years' investigations at East Malling Research Station into the incidence and spread in the field of reversion of black currants [*R.A.M.*, vii, p. 383]. In experiments on the control of the disease, systematic roguing methods [which are described] were adopted, cuttings were selected only from bushes which had never shown symptoms of disease, and every bush was examined early in the blossoming period, then between June and August, and finally about February in the following year. Twice as many cases of reversion were detected from leaf as from flower characters. The experiments were all conducted under unfavourable circumstances, as diseased material, kept for experimental purposes, was always present in the vicinity.

Surgical methods and spraying with lime-sulphur were applied to a plot of 879 currant bushes, and during the first four years these were effective in preventing the spread of infection from bush to bush [cf. ibid., iv, p. 680], but from 1924 onwards the disease grew steadily worse, spreading laterally across the plot from an adjacent

plantation which had reverted to a large extent and was infected with 'big bud' mites [*Eriophyes ribis*: ibid., vi, p. 564]. The incubation period of the disease does not seem generally to be delayed beyond one or, at most, two years, and an examination of the incidence of the disease showed that there had been practically no spread of infection from the early, treated cases within the plot. The subsequent history of healthy bushes planted where reverted bushes had been grubbed out did not suggest that infection is soil-borne. Although the removal of reverted portions did not usually arrest the disease in the individual bush, this practice is recommended as a precaution against spread to other bushes in the very early stages of attack, together with the grubbing up of all badly infected bushes.

No cutting which appeared even temporarily healthy was ever grown from a completely reverted bush, and it is considered to be highly unsafe to take cuttings even from healthy portions of partly-reverted bushes, since reversion may travel farther than can be recognized, and may be latent even when the blossom, leaves, and fruit appear normal. Thus, of 56 cuttings from apparently healthy portions of reverted bushes only 20 were normal after one year, while of 72 cuttings from reverted parts of the same bushes not one was then normal.

In 1920, a plot of 73 bushes of French Black (H 1), the best strain on the Station in 1919, was established with cuttings from apparently healthy bushes. As 4 per cent. of these reverted, a more systematic roguing was adopted, with the result that in 1923 out of 523 cuttings from the 73 bushes none reverted; in 1924, of 2,000 cuttings 1 reverted; in 1925, of 1,200 cuttings none reverted; and in 1926, of 2,300 cuttings 13 reverted. The presence of disease in the cuttings is attributed to the fact that some parent bushes, after appearing healthy during one season, showed extreme reversion the following spring. As this risk increases with the age of the bush and of the plantation, cuttings should be made only from bushes 2 to 5 years old. Encouraging results also followed the establishment of clone lines from selected parents; of thousands of young bushes so raised during three years there were only five among those which reverted in which infection could not be traced to the presence of latent infection at the time the cutting was taken, as indicated by the subsequent rapid reverting of the parent.

WALLACE (T.). **Leaf scorch on fruit trees.**—*Journ. Pomol. and Hort. Science*, vi, 4, pp. 243–281, 3 pl., 1928.

In pot experiments at Long Ashton Research Station with gooseberry, black currant, and raspberry plants grown in sand and treated with different nutrient solutions, leaf scorch [*R.A.M.*, iii, p. 160; iv, pp. 354, 546] developed only in those plants which received a nutrient solution not containing potassium; the disease was prevented by reducing the nitrogen-potassium ratio of the nutrient, and in gooseberry bushes suffering severely from potassium starvation, by spraying with 1 per cent. sulphate of potash. The potash radical is considered as the effective one, since in other experiments deficiency of the sulphate radical did not result in leaf

scorch. In pot experiments marginal leaf scorch was caused by waterlogging, while failure to leach the sand periodically in pots being treated with nutrient solutions (in order to prevent the accumulation of unabsorbed salts) proved deleterious or even fatal to strawberry plants, but promoted the growth of gooseberry and black currant bushes, and in pots receiving a nutrient solution deficient in one element led to pronounced scorching except where nitrogen was omitted. It is suggested that these conditions are simulated in soils having an impervious subsoil.

From numerous field and laboratory observations of the soil in many leaf scorch areas in the West Midlands and south-eastern counties of England [the data regarding which are tabulated and discussed in considerable detail], it appears that, in the areas concerned, leaf scorch is closely related both to excessive and deficient soil-water. This conclusion was supported by the fact that leaf scorch was obtained on apple by gradually drying out the soil in which the plant was growing and wetting the foliage when a certain stage of drying was reached. The disease was also induced on gooseberry bushes growing in sand and receiving a sufficient nutrient solution, by waterlogging the roots after healthy leaves had developed.

Potash supply and the rate of spring growth may also be concerned in the production of leaf scorch on light soils; the very similar non-parasitic disease known as flavescence, rougeau, or brunissure of the vine [ibid., v, p. 145] is most prevalent during excessive wet or drought, and is also amenable to potash treatment [ibid., iv, p. 78; v, p. 146].

The available amount of potash in the surface soils of the scorch areas and in some of the scorch-free areas was generally low, but in all the latter the soil texture was superior to the former when considered in its relation to the soil water. In view, however, of the importance of the nitrogen-potassium ratio and of the action of the potassium in controlling the rate of transpiration [ibid., iv, p. 757], the values obtained for available potash are not regarded as of the first importance. Even where they were relatively high, fertilizing with potash sometimes has a marked effect in checking scorch.

The available phosphate in the surface soils of the scorch areas was generally above the average for arable land (above 0·02, and in six cases above 0·05, per cent.). The disease occurs on non-acid soils containing 0 to 31·65 per cent. calcium carbonate, and also on acid soils, the highest 'lime-requirement' figure obtained in these being 0.49 per cent. In only 11 instances were the surface soils acid and devoid of carbonate of lime, and in only 5 of these did the lime-requirement value exceed 0·2 per cent. Most of the surface soils contained less than 1 per cent. carbonate of lime and were not acid.

In some scorch areas manures had never been applied; in others they were generally organic and contained nitrogen and phosphates but little or no potash. Farmyard or potash manure was nowhere used regularly; lime was applied frequently at some centres and not at all at others. Leaf scorch often developed where regular applications of manure containing nitrogen and phosphates were

made, but never occurred where potash manuring was regularly practised.

O'Brien (D. G.) & M'Naughton (E. J.). **The endotrophic mycorrhiza of Strawberries and its significance.**—*West of Scotland Agric. Coll. Res. Bull.* 1, 32 pp., 6 pl., 1928.

In this paper a detailed account is given of a mycological investigation conducted during 1926–7 into the Lanarkshire strawberry disease [*R.A.M.*, vii, p. 384], which the authors regard as the most serious form of a 'root weakness' that is widespread in strawberries in many parts of Great Britain. The chief characteristic of this condition is the paucity of lateral branches and fibrous rootlets on the primary roots.

It was observed in the Clyde Valley that where the attack was light infection was sporadic, but where it was severe the diseased plants were grouped in definite, though irregular, patches. Entire fields were often devastated, and similar extensive attacks were also reported from various parts of England. The authors disagree with Wardlaw's view [ibid., vii, p. 253] that the trouble is primarily due to bad soil conditions, and state that the disease may be serious even on good soils, well manured and drained. The obvious lack of finer absorbing roots is regarded as the primary cause of the above-ground symptoms. These roots are formed, but are cast off more or less rapidly according to the intensity of the disease.

Numerous isolations from dead and dying tissues of the roots of diseased strawberry plants gave species of *Pythium*, *Fusarium*, *Cephalosporium*, and *Rhizoctonia*, but as these organisms were not observed to invade healthy roots they are regarded merely as secondary parasites.

Examination of diseased material from all parts of the country revealed the constant presence of an endotrophic mycorrhizal fungus of the common type bearing arbuscles and vesicles [ibid., iv, pp. 301, 755]; this is considered to be a parasite, and the fundamental cause of the disease whenever it occurs. The morphology of this endophyte and its relations to the root tissues of the host plant are described in considerable detail and admirably illustrated. Spores were not observed in the vesicles.

In support of their view, the authors point out that, with regard to mycorrhiza, the whole theory of symbiosis rests on the assumption that the invading organism is completely digested by the host cells and the digested products are utilized by the plant. Where an endotrophic mycorrhiza of this type is concerned, the extent to which the host benefits depends upon the degree in which the latter digests the endophyte, and upon their reciprocal relations. The strawberry endophyte, it is stated, depletes the cortex of the host of its contents; this is shown by the demonstrable disappearance of starch from cells within the zone of influence of the fungus. There is no return of starch to the depleted cells, and the constant drain on the resources of the plants by the withdrawal of nutrient material seriously inhibits growth, especially of the roots. The arbuscles, which act as haustorial structures, do not appear to be

digested beyond the sporangiole stage [ibid., v, p. 380], and by that time the parasitized cells are dead.

Maximum infection occurs at or about the flowering time of the plant, when fine, fibrous roots are abundantly produced. When the infection is severe, the finer rootlets, which become somewhat swollen and brittle where they harbour the endophyte, are ruptured and drop off; if the rupture occurs at some distance from the apex a considerable length of root may be lost. The starved roots may continue to produce short lateral branches, which may be attacked in their turn. The roots of diseased plants are in some parts profusely covered with stunted fibres and in others are almost bare. Infected plants are thus to varying degrees deprived of their finer root fibres, and to this is ascribed the failure of the absorbing system. In the strawberry mycorrhiza the endophyte is active and of high virulence, while the digestive capacity of the host is late in commencing and partial in action.

Since attempts to isolate the endophyte failed, inoculation experiments with cultures of the fungus were not possible. Inoculation by adding infected root tips to sterilized soil are in progress, but though they appear to have resulted in a reduction of the number of absorbing rootlets in the inoculated plants, it is too early as yet to reach definite conclusions.

The disease is ordinarily slow and chronic, but may be aggravated by unfavourable growth conditions so that severe infection may kill the plants. The mycorrhiza prepares the way for the entry of secondary fungi and bacteria. The fragments broken off from diseased roots infect the surrounding soil; young runners from affected plants are free from the disease until they strike root in the soil, when they become infected in their turn. There is evidence that the fungus may infect other plants, such as grasses and clovers, which may transmit the disease to strawberries.

The paper terminates with an outline of control measures, and there is a bibliography of 42 titles.

THOMAS (H. E.). **Killing of Strawberry roots.**—*Phytopath.*, xviii, 2, pp. 245–246, 1928.

Since 1922 strawberry plants of all varieties in New York State have been observed to suffer from severe injury involving the destruction of the roots from below upwards. The plants tend to form new roots higher up on the collar, which breaks down in the later stages of the disease, usually at the end from which the stolon has been detached. The entire plant is frequently destroyed, and young ones sometimes die in the same season in which they are produced. Injured plants showed a tendency to recover when potted in greenhouse soil. Fungi of the genus *Cephalosporium* or closely related genera were obtained in isolations from at least five out of twelve localities, but it would appear from observations on special plantings of Parson's Beauty and other varieties that the type and exposure of soil, low temperatures, the application of lime, and mulching practice are more important factors in the etiology of the disease.

PRATOLONGO (U.) & ALLAN (M. P.). **Sulla costituzione e sulla proprietà di alcuni antiperonosporici più usati.** [On the composition and properties of some anti-*Peronospora* preparations in common use.]—*Giorn. Chim. Ind. Appl.*, x, 1, pp. 3–7, 1 graph, 1928.

The writers recently conducted a series of investigations at the Milan Agricultural College on the composition and the chemical and physiological properties of some standard preparations for the control of *Peronospora* of the vine (*Plasmopara viticola*), leaf spot of beets (*Cercospora beticola*), and other fungous diseases of plants. The efficacy of Caffaro paste was found to be due to the compound 3 $CuO,CuCl_2$; of Caffaro powder to 3 $CuO,CaCl_2$ [*R.A.M.*, v, p. 681 *et passim*]; and of copper protector ('protector ramato') to $CuCO_3,Cu(OH)_2$. The most soluble of these is the calcium copper oxychloride, and the least so the copper oxychloride and basic carbonate, the resistance to washing off being in inverse ratio to solubility. Poisoning of stock fed on treated beet tops is improbable in view of the low solubility of the basic copper compounds in the slightly acid gastric contents.

SWINGLE (H. S.). **Chemical changes in dusting mixtures of sulphur, lead arsenate, and lime during storage.**—*Journ. Agric. Res.*, xxxvi, 2, pp. 183–192, 1928.

The investigation briefly outlined in this paper was undertaken with the view to determining the nature and extent of the changes that occur during storage in the 80–5–15 sulphur-lead arsenate-hydrated lime dust commonly used for the control of insects and fungous diseases on peaches, and also the effect of these changes upon the insecticidal and fungicidal value of the dust. Chemical tests [details of which are given] showed that the darkening which usually occurs in the colour of the dust after the first month of storage is first due to the reaction of lime with sulphur to form calcium sulphide and calcium sulphite as follows:

$$3Ca(OH)_2 + 3S = 2CaS + CaSO_3 + 3H_2O.$$

Part of the calcium sulphide formed then reacts with lead arsenate to form black lead sulphide: $PbHAsO_4 + CaS = CaHAsO_4 + PbS$, thus causing the dust to become grey to black, depending on the extent of the reaction. All hydrated lime not reacting with sulphur or lead arsenate is converted into calcium carbonate within one year or less.

Chemical analysis indicated that little or no change in the insecticidal or fungicidal value of the dust occurs in storage, since it was found that the greatest quantity of sulphur undergoing chemical change was less than 0·5 per cent. of the total quantity, and since the calcium arsenate which is formed to some extent has been proved to be almost as effective an insecticide as lead arsenate. Field dusting tests showed, however, that there is some increase in the danger of plant injury from the use of old dusts, and that the darker the dust the greater is this danger.

DORAN (W. L.). **Acetic acid as a soil disinfectant.**—*Journ. Agric. Res.*, xxxvi, 3, pp. 269–280, 2 pl., 1928.

Soil infested with *Thielavia basicola* was treated with normal

acetic acid at the rates of 7, 14, and 21 c.c. per 100 gm. of the soil, and four weeks later was planted with tobacco seeds. When the plants were seven weeks old those in the treated soil were free from infection, while those in the control pots were severely infected. Twelve weeks after the acid application, healthy tobacco plants were set in this soil, and the same result was obtained. Only the heaviest rate of application interfered with germination or growth in either experiment. It was found that the acid was not toxic to tobacco plants in a well-buffered soil (water-deposited silt or fine sandy loam), but was toxic when applied to a poorly buffered soil (ice-deposited stony loam). It was also found that the acid had no lasting effect on the P_H value of the soils to which it was applied.

When soil infested with species of *Pythium* and *Rhizoctonia* was treated with 1·2 per cent. acetic acid (2 qt. per sq. ft.) and planted ten days later with cucumber, tomato, and lettuce seeds, the losses from failure to germinate and damping-off were only 2, 3, and 0 per cent. respectively, as compared with 75, 30, and 53 per cent. in the untreated controls. Almost equally good results followed the application of 0·8 per cent. acid, but a concentration of 0·4 was ineffectual. When tobacco was grown in this soil it was found that for each 100 plants living in the untreated soil, there were 367 in that treated with 0·8 per cent. acid, and rather more in that which received 1·2 per cent. acid.

Immediate sowing in treated soil was found to injure the seed. The time that should elapse between treatment and sowing varies with different seeds. With tobacco an interval of a week was sufficient, but with other seeds 10 to 14 days would probably be safer.

Similar results were obtained in the treatment of white spruce [*Picea canadensis*] seed-beds with 1·64 qt. of acetic acid at the concentrations of 1·12 and 1·68 per cent. per sq. ft., there being 315 and 281 plants, respectively, for each 100 in the controls, after four months.

Brown root rot of tobacco [ibid., vi, p. 3] was controlled by applications of 1 per cent. acetic acid to the soil three weeks before sowing.

The cost of the acetic acid at the concentrations used (1 to 1·2 per cent.) was $231 per acre, while that of formaldehyde 1 in 50 was $475 per acre.

BÜRKLE (W.). **Saatenanerkennung und Samenkontrolle in den verschiedenen Ländern der Erde.** [Seed certification and inspection in the various countries of the world.]—*Ber. über Landw.*, N.F., Supplement 7, 81 pp., 2 diags., 1928.

In this interesting paper the writer presents the results of his inquiry, conducted under the auspices of the Ministry of Food and the German Agricultural Society, into the methods and organization of seed certification and inspection in various countries [*R.A.M.*, vii, p. 389].

Practically speaking, the organization of seed certification is everywhere uniform, the work being performed by agricultural departments or similar bodies, assisted in some countries (e.g., the United States) by agricultural colleges and experiment stations.

In a few countries, such as Austria, Czecho-Slovakia, and Portugal, the organization of inspection and certification rests on a legal basis.

Participation in the privileges of seed certification is accorded in some countries only to the members of co-operative societies, seed growers' associations, and the like, while in countries where the work is under State control the general public may share in the benefits. In Germany and Austria both these methods of organization are recognized.

In the United States, Canada, and Holland only certain recognized varieties are admitted to inspection, and a similar step is to be taken in Germany with regard to potatoes.

In all countries the work of certification is based on one or more field surveys, as well as on the examination of seed samples destined for sale. The verdict on the growing crop is given at the discretion of the inspector in the United States and Canada, whereas in certain other countries (Holland, Portugal, and Austria) an exact system of classification is followed. The United States and Canada set the highest standards in respect of freedom from diseases, and it is very desirable that stricter regulations should be enforced in Germany.

In Great Britain and Ireland only potatoes are stated to be subject to certification, in Hungary only cereal crops, and in Portugal only wheat, rye, maize, and rice.

It is estimated that certified seed fetches prices ranging from 40 to 70 per cent. above the ordinary market price for non-certified material, but complete uniformity in this respect has been secured only in Poland.

The paper further contains a great deal of valuable information on various other points of interest, including details of the work of certification as applied to individual crops and their diseases, and the writer concludes with a number of suggestions for the improvement of the German system.

A bibliography of 74 titles is appended.

ESMARCH (F.). **Pilzliche Samenverderber.** [Fungous seed destroyers.]—*Die Kranke Pflanze,* v, 1, pp. 4–7 ; 2, pp. 24–27 ; 3, pp. 40–44, 1928.

Directions are given in popular terms for the recognition and treatment of a number of well-known fungous and bacterial diseases of cereal, legume, beet, vegetable, and other seeds. The organisms mentioned are mostly those that are capable of causing damage to fresh and stored seed.

HINO (I.). **Early important records on phytopathological science in the Orient.**—*Nôgyô Oyobi Engei,* ii, 11–12, pp. 1223–1334, 4 pl., 5 figs., 1927. [Japanese.]

In a manuscript résumé of this paper the author states that the hot water treatment of crop seeds against seed-borne diseases is mentioned in a Chinese work, 'Yu Ti Mien Hua Tu', published, probably, in 1765; the heteroecism of *Gymnosporangium* on pear is referred to in a Korean book, 'Hang Po Si', published before 1834; that transmission of the mosaic virus of rice dwarf by the

insect *Nephotettix apicalis* was discovered by Kangô Takata, agronomist at the Shiga Agricultural Experiment Station, Japan from 1895 to 1902; and that the floral infection in loose smut of barley [*Ustilago nuda*] was discovered by Daikiti Satô and Tadamasa Yamada in 1896, independently of the discovery of that of loose smut of wheat [*U. tritici*] by Maddox in Tasmania in 1895. He also states that a chair of plant pathology was established at Tokio Imperial University as early as 1906, the first holder being Mitsutarô Shirai.

COSTANTIN (J.). **Peut-on employer le mot 'acclimatation' à propos du Pleurotus de l'Eryngium campestre?** [Can the term 'acclimatization' be used in respect of the *Pleurotus* on *Eryngium campestre*?]—*Bull. Muséum National Hist. Nat., 1927*, 6, pp. 543–544, 1927. [Received May, 1928.]

The fact that since 1924, when a station of *Pleurotus eryngii* was artificially created in the Forest of Fontainebleau [*R.A.M.*, v, p. 176], the fungus has been found every consecutive autumn in the same spot, leads the author to consider that it has become acclimatized there. This conclusion is further supported by the results of another attempt to create a new station of *P. eryngii*, made in 1924 in the Department of Deux-Sèvres, which indicate that the fungus has not only maintained itself but has even spread over a radius of about 100 m. from the original point of inoculation of the soil.

McKINNEY (H. H.). **Centrifuging filterable viruses.**—*Science*, N.S., lxvii, 1732, p. 271, 1928.

With reference to his previous paper on the concentration of the virus of tobacco mosaic by means of a high speed centrifuge [*R.A.M.*, vii, p. 45], the author states that his studies indicate that physical and chemical treatments which cause coagulation and precipitation to take place in plant extracts also cause or assist the virus to settle out of the extract. It is pointed out, however, that the relative advantages of the various treatments, and the exact relations between the virus particles and other particles that are precipitated out of the extracts, are not fully known. Some treatments produce very finely divided coagula heavily charged with virus which can be separated out almost entirely by means of the high speed centrifuge.

KOCH (M.). **Die Kuhn'schen Bacteriophagen.** [Kuhn's bacteriophages.]—*Bot. Arch.*, xix, 3–4, pp. 275–313, 1 pl., 2 figs., 1927. [English summary.]

This is the full account [a preliminary report of which has already been noticed: *R.A.M.*, vii, p. 107] of the author's work, in collaboration with Ziegenspeck, in the investigation of the *Pettenkoferia* organism recently discovered by Phil. Kuhn. The paper starts with a very comprehensive historical review of the different opinions held by various investigators in regard to the existence of nuclei in bacteria, their sexuality, the occurrence of 'degenerative' or 'involution' forms in old cultures, the supposed pleomorphism or mutations of bacteria, and d'Hérelle's conception of bacterio-

phagy which introduced the idea of the possible existence of an endoparasite of bacteria.

In their work, the present investigators used sporing forms of *Bacillus mesentericus vulgatus*, *B. mycoides*, and *B. subtilis.* Examination of stained material entirely confirmed Kuhn's findings, but in order to obviate possible objections that the formations seen under the microscope were artifacts, it was decided to study living cultures. For this purpose the bacteria were cultured in Uschinsky-Fränkel's mineral nutrient solution [the formula of which is given], which was first painstakingly filtered through ultra-filters in order to obtain a medium as nearly optically empty as possible. Drops of the cultures were examined for long periods at a time under a high power microscope with dark ground illumination, which allowed of easily differentiating between the bacteria and their inclusions. All glassware used in the experiments was of Jena glass first boiled in hydrochloric acid, and the chambers in which the bacteria were observed under the microscope were of quartz.

The results of the numerous and varied observations again confirmed the presence in the cultures of small bodies, actively motile presumably owing to their being provided with flagella. These bodies occurred both in the culture medium and inside the bacteria, as already described in the preliminary report [loc. cit.], and their activity and multiplication could be followed. In some cases the author states that he was able to see some of these bodies pursuing and attacking a bacterium, which vainly tried to shake them off by violent contractions; in other cases the bacterium appeared to defend itself by forming a constriction to cut off the portion invaded. The bacterium was never seen to sporulate after infection, and in the final result it invariably perished. Attempts were also made to separate the bacteria from their parasites, but as the latter withstood temperatures much higher (up to 125° C. for five minutes) than their hosts and even than the spores of the latter, it was found impossible to obtain uninfected strains of the bacteria. Pure cultures, however, were obtained of the endoparasite, which could be further sub-cultured in the presence of dead bacteria, but not on synthetic media in the absence of the latter.

Besides a purely vegetative multiplication, the author believes that he has observed a sexual cycle of development in *Pettenkoferia*, consisting in the fusion of numerous and extremely small gametes (male ?) with much larger ones (female ?); nuclear fusion does not appear to occur, however, as the new bodies thus formed ($x+x$ generation) were seen to have two independent nuclei. This stage possesses the remarkable property that several of the fusion bodies may unite to form 'plasmodia' which increase in size, until fairly large dimensions are attained. The plasmodia soon contract into a spherical mass surrounded by a tough wall. After a period of rest, the wall of these cysts appears to be resorbed, and their contents swell; at this period the larger bodies contained in the cysts divide into diads and tetrads, so that there is a possibility of a reduction division in the life-history. The contents of the cyst then break up, and small bodies swarm out of it and thus form the starting-point of a new life-cycle.

The paper terminates with a valuable bibliography of 153 titles.

BALLION (G. & M.). **Asymbiotic germination of Orchid seed.**—*Orchid Rev.*, xxxvi, 418, pp. 103–111, 11 figs., 1928.

For several years the writers have obtained excellent results in the asymbiotic germination in Erlenmeyer flasks of a large number of orchids, including species of *Cattleya*, *Odontoglossum*, *Miltonia*, *Oncidium*, *Phalaenopsis*, and *Cymbidium* [*R.A.M.*, vii, p. 367]. Some *Miltonia* seedlings germinated by this method and then transplanted came into full flower in less than three years. Among other advantages of asymbiotic germination, attention is drawn to the rapid growth and vigorous health of the seedlings, enabling them to resist insect and fungous attacks. Dense sowing should be avoided and the seedlings should not remain in the flasks longer than six or seven months.

JOHNSON (J.). **Constant temperature and humidity chambers.**—*Phytopath.*, xviii, 2, pp. 227–238, 2 figs., 2 graphs, 1928.

In this paper the writer recapitulates the main features of his constant temperature and humidity chambers which have now been in almost continuous operation at Madison, Wisconsin, for five years [*R.A.M.*, i, p. 243], with the addition of certain modifications and improvements in the original design. Observations are made on the general plan of the equipment, the construction of the chambers, the regulation of temperature and humidity, the ventilation and circulation of air, the recording apparatus, the cost of construction and equipment (approximately $260 for one chamber), and a few of the experimental results obtained.

WATERS (C. W.). **The control of teliospore and urediniospore formation by experimental methods.**—*Phytopath.*, xviii, 2, pp. 157–213, 3 figs., 1928.

All the nine species of rusts (including *Uromyces appendiculatus* on bean, *Puccinia sorghi* [*P. zeae*] on maize, *P. asparagi* on asparagus, *P. triticina* on wheat, and *U. trifolii* on *Trifolium hybridum*), cultivated in the greenhouse during the writer's investigations on the control of teleutospore and uredospore formation, were found to depend, for the production of one or other of these types of spore, on the photosynthetic activity of the host, uredospores being formed under conditions of active metabolism and teleutospores when metabolism is lowered. Any single factor or complex of factors, such as light, temperature, and moisture, may so influence the carbohydrate metabolism of the host that the fungus reacts by changing from the uredo to the teleuto stage or vice versa.

Except in *P. triticina*, teleutospores were formed in all the rusts when the host plants were placed under various unfavourable environmental conditions. In seven of them, teleutospores were produced when the infected hosts were placed in darkness at 7° or 19° C., the development of this stage being accelerated at the former temperature. The gradual withdrawal of water from the infected hosts resulted in teleutospore production in three cases. The teleutospore stage of *U. appendiculatus* was formed several days earlier in the case of semi-resistant beans, e.g., Scarlet Wax, than in that of the susceptible variety Tennessee Green Pod. In some cases the development of uredospores was completely inhibited,

teleutospores appearing as a direct result of infection. When the growing point of the bean plants was removed immediately after inoculation, thereby preventing the withdrawal of food by the primordial leaves, teleutospore formation was postponed for several days. The stage of development of the host was not found, in itself, to be a factor influencing the type of spore formed, as teleutospore formation could be induced in quite young plants by appropriate treatment.

A method was devised whereby detached leaves or fragments of foliage could be successfully infected when floated on water or nutrient solutions in Petri dishes. By this means it was possible to secure regular and abundant infection with ten species of rusts, including the nine mentioned above. The heaviest infection and production of uredospores on bean leaves was obtained by transferring the leaves from distilled water to sugar solution six days after inoculation. Starch was formed in abundance at the time of uredospore development, while only a small quantity was produced at the teleutospore stage.

Teleutospore formation in most of the rusts cultured in Petri dishes was stimulated (*a*) by starvation of the host with the subsequent addition of a liberal food supply; (*b*) by the sudden transfer of the host leaves from a well-nourished condition to a state of starvation; or (*c*) by the continuous supply of food with the gradual dying of the host cells.

KHARBUSH (S. S.). **Contribution à l'étude des phénomènes sexuels chez les Ustilaginées.** [Contribution to the study of sexual phenomena in the Ustilaginaceae.]—*Ann. Sci. Nat. Bot.*, Sér. X, ix, 2, pp. 285–297, 2 figs., 1927.

The author, from a cytological study of *Ustilago avenae*, *U. hordei*, *U. hypodytes*, and *Entyloma ranunculi*, has confirmed the occurrence of binucleate cells in the mycelium just before the beginning of spore formation and the subsequent fusion of the nuclei within the spore [cf. *R.A.M.*, i, p. 451; iv, p. 270]. The final cells before fusion occurs are regarded as oogonia, within each of which, after nuclear fusion, a single oospore develops. In the first division of the fusion nucleus of *Ustilago*, which occurs in the promycelium, four chromosomes appear to be visible.

KHARBUSH (S. S.). **Recherches histologiques sur les Ustilaginées.** [Histological studies on the Ustilaginaceae.]—*Rev. Path. Vég. et Ent. Agric.*, xv, 2, pp. 48–56, 3 figs., 1928.

The author has continued his study of the cytology of the formation of the probasidia [smut spores] of the Ustilaginaceae and of the germination of the latter. In *Ustilago maydis* [*U. zeae*] the vegetative mycelium consists of cells that are uninucleate at first and then become plurinucleate. In the terminal parts of the thallus in which the spores arise, binucleate cells are found. The nuclei contain two chromosomes, and the nucleus of the smut spore, resulting from the fusion of the two nuclei of the terminal cells, has four chromosomes. On germination this nucleus passes into the promycelium and undergoes a reduction division in this organ

[cf. *R.A.M.*, iii, p. 101]. The sporidia have each a single nucleus with two chromosomes and the resulting mycelium only becomes plurinucleate in the host. The origin of the binucleate cells was not determined. In *Tilletia tritici* the early stages were not followed, but the binucleate cells give rise to spores in which fusion occurs just as in the preceding case. The nuclei in the promycelium have two chromosomes after division and one nucleus passes into each of the sporidia where it divides, so that the latter become binucleate.

JØRGENSEN (C. A.). **A periclinal Tomato-Potato chimaera.**—*Hereditas*, x, 3, pp. 293–302, 6 figs., 1 diag., 1928.

After a short account of the work of previous investigators in the development of chimaeras from the standpoint of disease resistance, the author describes his recent attempts to produce a potato chimaera resistant to late blight (*Phytophthora infestans*). For this purpose the comparatively resistant tomato was used as a partner, 200 cross-graftings being made between Alma and Wohltmann potato seedlings and Danish Export tomatoes. The results were of no practical value, since the combination developed on the opposite lines to those desired, i. e., the plants had a tomato core covered by a one-layered potato epidermis. The experiments are, however, considered to possess a certain interest as showing the possibility of raising chimaeras in which the potato is a partner.

TUCKER (J.). **Canadian certified seed Potatoes. Rules and regulations governing their production.**—*Canada Dept. of Agric. Pamphlet* 84, N.S., 11 pp., 1 fig., 1927.

Although the standards for the certification of seed-potatoes in Canada have been raised annually since 1920, in 1926 no fewer than 10,392 acres passed the inspection test.

The 1927 standard for the first field inspection remains much as before [*R.A.M.*, ii, p. 465]. The second field inspection allows a total of not more than three per cent. disease and the standard required (maximum amount of each disease permitted) is as follows: blackleg [*Bacillus atrosepticus*], leaf roll (including curly dwarf), and mosaic, 1 per cent. each, wilts [*Fusarium* spp. and *Verticillium albo-atrum*] 2 per cent. For the tuber inspection the figures now are: bacterial wet rot 0·5 per cent., late blight [*Phytophthora infestans*] and dry rot [*F. coeruleum*] 1 per cent., slight scabs [*Actinomyces scabies* and *Spongospora subterranea*] or *Rhizoctonia* [*Corticium solani*] 10 per cent., severe scabs 5 per cent., and necrosis, wilts, and internal discolorations other than those due to variety, 5 per cent. Not more than 7 per cent. total disease is allowed in the tuber inspection, except for slight scab or *C. solani*. Not more than 1 per cent. powdery scab [*S. subterranea*] is permitted. If more than 3 per cent. late blight is present at the autumn bin inspection the grower must not grade but may retain his stock for dispatch in the spring, after reinspection. Seed stocks improperly stored are refused certification.

Notes are also given on suitable methods of production and storage.

Křížek (K.). **Jak se rozšiřuje rakovina Bramborů?** [How does the Potato wart disease spread?]—*Ochrana Rostlin*, viii, 1, pp. 7–9, 1928.

The author states that a study of the notifications of outbreaks of potato wart disease (*Synchytrium endobioticum*), which are compulsory in Czecho-Slovakia, has shown that in many cases fresh outbreaks are traceable to the purchase of seed potatoes from infected areas. He emphasizes, therefore, the necessity of careful discrimination in the choice of the sources from which the seed is obtained, and also of knowing the previous history of the line of potatoes purchased. A list is appended of the localities known to be infected with wart disease in Czecho-Slovakia, Moravia, and Silesia. This list is compiled in chronological order of discovery, and shows the spread of the disease from 1915 to the end of 1927.

Brüne (F.). **Ergebnisse von vergleichenden Kartoffelsortenversuchen auf Hochmoor-, Sand- und Marschböden im Jahre 1927.** [Results of comparative experiments with Potato varieties on moorland, sand, and fen soils in the year 1927.]—*Mitt. Ver. Förderung der Moorkult. im Deutschen Reiche*, xlvi, 3, pp. 18–23; 4, pp. 36–40, 1928.

In a series of comparative experiments with eleven different potato varieties cultivated on moorland, sand, and fen soils in the Bremen district (north-west Germany), the highest degree of resistance to late blight (*Phytophthora infestans*) was shown by Modrow's Johannssen and Rotkaragis (Rabbethge and Giesecke, Kartoffelzucht, G. m. b. H.), while Böhm's allerfrüheste Gelbe, Roode Star, Bonte Star, Böhm's Edeltraut, Ragis Zehn, and Gelbkaragis (Rabbethge and Giesecke) were only slightly infected. The most susceptible varieties were Eigenheimer, Modrow's Preussen, and Industrie. Rotkaragis was affected by sprain and Böhm's allerfrüheste Gelbe by heart necrosis [? hollow heart: *R.A.M.*, vii, p. 343].

Müller (K. O.). **Über den 'echten Mehltau' der Kartoffel.** [On the 'true mildew' of the Potato.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, viii, 3, pp. 19–20, 1 fig., 1928.

Potato plants grown out-of-doors at Dahlem (Berlin) and subsequently transferred to the greenhouse were attacked in the autumn of 1927 by an *Oidium* believed to be identical with *Erysiphe solani* Vanha [? *E. cichoracearum*: *R.A.M.*, vi, p. 714]. The mycelium was confined to the upper surface of the leaves, where it formed white or greyish patches, 1 to 5 square cm. in size. It formed spherical or elliptical haustoria in the epidermal cells and bore chains of conidia which measured 31 by 19·7 μ, with a ratio of length to breadth of 1·64. Perithecia were not observed.

Benlloch (M.). **El 'negrón' o marchitez temprana de los Patatares. (Alternaria solani [E. et M.] Sorauer.)** [The 'blackening' or early blight of Potatoes. (*Alernartia solani* [E. et M.] Sorauer).]—*Bol. Pat. Veg. y Ent. Agric.*, ii, 8–9, pp. 107–113, 3 figs., 1927. [Received June, 1928.]

Notes are given on the symptoms and the life-history of the

causal organism of early blight of potatoes (*Alternaria solani*), which was reported from La Poveda, Madrid, in the spring of 1926, and in the following year from Catalayud in the valley of the Jalón [Aragon]. The disease, which does not appear to have been previously recorded on a large scale in Spain, has also been observed by Prof. González Fragoso on *Datura stramonium*, *Hyoscyamus albus*, *H. niger*, and *Solanum nigrum*. Specimens of tomatoes recently received from the Canary Isles showed the typical *Alternaria* spots on the leaves, but in the absence of spores the causal organism could not be definitely identified. The spores in the author's specimens from potatoes measured 200 to 300 by 15 to 22 μ. In addition to the usual cultural methods of prevention, the writer recommends one or two applications of Bordeaux mixture with molasses at the time of flowering.

ABE (T.). **Experimentelle Studien über die Pilzschäden von Reissämlingen. IV.** [Experimental studies on the fungous injuries of Rice seedlings. IV.]—*Journ. Plant Protect.*, xiv, 12 pp., 1927. (Japanese.) [Abs. in *Japanese Journ. of Botany*, iv, 1, p. (1), 1928.]

Helminthosporium oryzae and *Achlya prolifera* [*R.A.M.*, vii, p. 266] were found to grow well in an atmosphere of pure hydrogen. *A. prolifera* also developed fairly well in a chamber deoxygenated by means of pyrogallol, whereas *H. oryzae*, *Hypochnus* [? *Corticium centrifugum*: ibid., vii, p. 296], and *Pestalozzia* sp. made no growth under these conditions. It was further demonstrated that the lack of oxygen itself, and not the accompanying reduction of pressure, is responsible for the cessation of growth in the latter fungi. The minimum, optimum, and maximum hydrogen-ion concentrations for the development of *A. prolifera* were determined as P_H 4·0, 6·2 to 7·2, and 8·4, respectively. The hydrogen-ion concentration of a medium containing 1 per cent. peptone was found to veer gradually towards the alkaline side.

PROCHASKA (M.). **Beobachtungen über das Auftreten von Peronospora arborescens (falscher Meltau) auf Papaver somniferum.** [Observations on the occurrence of *Peronospora arborescens* (downy mildew) on *Papaver somniferum*.]—*Fortschr. der Landw.*, iii, 4, pp. 165–167, 4 figs., 1 diag., 1928.

Opium poppies (*Papaver somniferum*) at Klosterneuburg (Lower Austria) were severely attacked in 1927 by downy mildew (*Peronospora arborescens*) [*R.A.M.*, iii, p. 318]. The disease was most conspicuous on the Esterhaza variety, which showed 60 to 70 per cent. infection, and least so (15 per cent.) on a Burgenland variety with white seeds. Other varieties showing more or less heavy infection were Riesengebirg, Zwettler, Raaber, and Reiss (30 to 70 per cent.). The control of the disease should be based on crop rotation, wide spacing, and the avoidance of low-lying, damp sites. Infected plants should be destroyed immediately, and abnormally small and malformed capsules rejected for seed. Seed from such capsules failed to germinate in laboratory tests at the Klosterneuburg Experiment Station.

Yossifovitch (M.). **Kingdom of the Serbs, Croats, and Slovenes: a destructive disease of the Poppy in Southern Serbia.**—*Internat. Bull. Plant Protect.*, ii, 2, pp. 18–19, 1928.

Enormous damage was caused to the normally very remunerative opium poppy (*Papaver somniferum*) cultivation in southern Serbia during the spring of 1927 by mildew (*Peronospora arborescens*) [see preceding abstract], which reduced the crop by one-half or two-thirds in certain districts, and in some cases totally destroyed it. The disease appeared early in May in sheltered localities and a little later in the more exposed regions. Infection spread upwards from the lower leaves, which were entirely covered by the downy coating composed of the conidiophores and conidia of the fungus. The tops of the plants frequently remained quite healthy, but by the beginning of June the lower leaves were completely dry, while the middle ones were covered with numerous brown patches. The stems and even the capsules were attacked, the stem bases often being girdled and the whole plant dying prematurely. Notwithstanding the very dry weather during May the disease continued to spread, showing that humidity is not essential to its development. Poppy mildew had previously occurred in a milder form in 1926.

Lee (H. A.) & Martin (J. P.). **Effect of fertilizer constituents on the eye-spot disease of Sugar Cane.**—*Indus. & Engin. Chem.*, xx, 2, pp. 220–224, 6 graphs, 1928.

A method is described of measuring quantitatively the degree of infection of eye spot of sugar-cane (*Helminthosporium sacchari*), which causes heavy losses on the otherwise highly productive H. 109 variety in the Hawaiian Islands [*R.A.M.*, vii, p. 401].

It was shown by a series of field experiments [details of which are given] that the disease reaches one or more peaks of maximum infection during the winter months, when scarcity of sunshine is combined with long periods of dew on the leaves, and often accompanied by continuous rainfall. The incidence of infection subsides abruptly during the summer months, when the amount of sunshine increases and the rainfall is less.

Heavy applications of nitrogen (300 lb. per acre) were found in one experiment to increase the number of infections at the peak of the outbreak by 238 per cent., compared with the plots receiving no nitrogen. In plots receiving moderate applications of nitrogen (65 lb. per acre) there was 77 per cent. more infection than in those not so treated. In another test the corresponding figures for the plots receiving heavy and moderate doses of nitrogen were, respectively, 273 and 80 per cent. more infection than in those given no nitrogen. It is concluded that applications of nitrogen should be avoided in fields subject to eye spot during the season favourable for infection. They may safely be given, however, from April to July, inclusive.

In these experiments nitrogen did not induce a more vigorous growth of the canes, and it is therefore assumed that the increase of infection due to this treatment is correlated with some other physiological reaction in the plants. Phosphoric acid (400 lb. per acre), on the other hand, both stimulated the development of the

canes and reduced the incidence of infection at the peaks of the outbreak. A slight reduction of infection was also secured by the application of potash at the rate of 300 lb. per acre.

VIZIOLI (J.). **Estudo preliminar sobre um novo pyrenomyceto parasita da Canna.** [Preliminary study on a new Pyrenomycete parasitic on the Cane.]—*Bol. Agric. São Paulo*, Ser. XXVII a, 1–3, pp. 60–69, 3 pl., 1926. [Received March, 1928.]

In December, 1925, the writer examined some young P.O.J. 228 sugar-cane leaves from Campinas, São Paulo, Brazil, which showed black scabs covering areas varying in size from minute dots or longitudinal stripes to irregular lesions affecting more than a square centimetre of the lamina. The white layers of closely interwoven, compact hyphae that cover these spots and extend over the surface of the leaf resemble pseudoparenchymatous stromata, especially when situated between two new leaves, or within furled leaves, in which case the laminae are stuck together. The hyphae constituting this stromatic mass are at first hyaline tinged with yellow (later pale grey) and of a fleshy consistency, septate, and branched; they contain numerous oil drops, and measure 3 to 6 μ in width. The loculate, uniseriate, flask-shaped perithecia, measuring 250 to 380 by 200 to 300 μ, are completely immersed in the stroma and delimited by a zone of dark, almost black tissue; they are not erumpent and are furnished with a circular ostiole. The long, fusiform asci, measuring 210 to 250 by 12 to 16 μ, are arranged in bundles and contain numerous hyaline, simple, unicellular, aciculiform, straight or slightly curved ascospores, measuring 18 to 25 by 1·5 μ in diameter.

Discussing the taxonomy of this organism, the author considers that its characters approximate most closely to those of the genus *Myriogenospora* of the Dothideales, and as it is apparently new to science, it is provisionally named *M.* (?) *aciculisporae* n. sp., with a technical diagnosis in Portuguese.

The disease produced by this fungus caused a certain amount of apprehension amongst the planters owing to its tendency to progressive increase.

BOLLE (P[IERRETTE] C.). **Verdere onderzoekingen over pokkahboeng en toprot.** [Further investigations on pokkah boeng and top rot.]—*Arch. Suikerind. Nederl.-Indië*, I Deel, xxxvi, 6, pp. 116–129, 1928.

In view of the increasing prevalence of 'pokkah boeng' in the 2878 P.O.J. variety of sugar-cane in Java, the writer recapitulates her description of the symptoms of this disease [*R.A.M.*, vii, p. 200] and gives an account of her further investigations on its etiology. The typical symptoms of pokkah boeng were reproduced by inoculation of the leaf sheaths with pure cultures of *Fusarium moniliforme* [*Gibberella moniliformis*] isolated from diseased canes, and the causal organism reisolated from the newly infected individuals.

The variety 2722 P.O.J. is very susceptible to a form of top rot resembling that caused by *Phytomonas rubrilineans* in Hawaii [ibid., v, pp. 133, 696]. Experiments are in progress to ascertain

the cause of this disease in Java, where it is thought to have been endemic for a number of years.

Ciferri (R.) & González Fragoso (R.). **Hongos parásitos y saprofitos de la República Dominicana. (13ª y 14ª Series.)** [Parasitic and saprophytic fungi of the Dominican Republic. (13th and 14th Series).]—*Bol. R. Soc. Española Hist. Nat.*, xxviii, 2, pp. 131–144, 7 figs., 1928.

The following items are of interest in this continuation of the authors' enumeration of the fungi of the Dominican Republic [*R.A.M.*, vii, p. 201]. *Puccinia panici* was found on living leaves of *Panicum maximum*. Living leaves of sweet potato were attacked by *Coleosporium ipomoeae*. *Sphaeropsis heveae* n. sp. ad int. produces irregular, dry spots, 2 to 5 mm. in diameter, with chestnut or reddish-brown margins, on withered or living *Hevea* rubber leaves; the spores of the fungus are chestnut-coloured, ellipsoidal, tapering towards the extremities, uniguttulate, and measure 10 to 13 by 2 to 5·6 μ. *Pestalozzia guepini* was found on mango leaves in association with *Cladosporium herbarum*. *Cercospora canescens* was observed on bean (*Phaseolus vulgaris*) leaves and *Cladosporium pisi* [*C. herbarum*: ibid., vi, p. 331] on those of the cowpea.

Chardon (C. E.). **Contribución al estudio de la flora micológica de Colombia.** [Contribution to the study of the mycological flora of Colombia.]—*Bol. R. Soc. Española Hist. Nat.*, xxviii, 2, pp. 111–124, 2 pl. (1 col.), 1928.

The following items, other than those already noticed, are of interest in this account of the mycological flora of Colombia (South America), based on studies made from April till June, 1926. *Pseudoperonospora cubensis* was found on living leaves of *Pepo* [*Cucurbita*] *moschata*. The living branches, leaves, and fruit of *Coffea arabica* were seriously damaged by sooty mould (*Capnodium brasiliense*), and the roots of the same host were attacked by *Xylaria polymorpha*, which was only found in the conidial stage. *Irene perseae* was found on living leaves of avocado pear, *Phyllachora maydis* on living maize leaves, and *Ustilago zeae* on the ears and grain of the latter host.

Montemartini (L.). **Note di fitopatologia.** [Phytopathological notes.]—*Riv. Pat. Veg.*, xviii, 1–2, pp. 1–7, 1928.

During the summer of 1927, plants of *Impatiens balsamina* in the Botanical Gardens, Rome, died from a wilt associated with bacteria and a species of *Alternaria*. Attempts to reproduce the disease, which is attributed to exceptionally hot, dry weather, were unsuccessful.

Acanthus plants in the Botanical Gardens, Rome, were severely attacked by *Septoria acanthi* and *Oidium erysiphoides*, of which the latter was extensively parasitized by *Cicinnobolus cesatii*. After killing the mildew fungus, the pycnidia of *C. cesatii* were observed to be in direct contact with the leaf of the host plant, on which the fungus was living, apparently, as a true parasite.

During very hot, dry weather, a carob tree [*Ceratonia siliqua*] near the Botanical Institute, Rome, was affected by the mildew

Oidium ceratoniae [*R.A.M.*, iii, p. 181], which was arrested, however, by a cool, wet September, when, except during a hot spell later, new leaves growing near others severely infected remained healthy. Under Italian conditions the fungus can overwinter as mycelium, and even in January the author noticed a leaf showing lesions with living hyphae and conidia.

THOMPSON (A.). **A preliminary note on Phytophthora spp. found in Malaya.**—*Malayan Agric. Journ.*, xvi, 2, pp. 40–47, 1928.

Of the three fungi which the author has isolated from patch canker of *Hevea* rubber, two were found in Perak, namely: a species of *Pythium* formerly reported as a *Phytophthora* [*R.A.M.*, vi, p. 656], and a species of *Phytophthora* morphologically and culturally indistinguishable from a strain of *P. faberi* isolated by the author from black stripe disease of *Hevea* in Malacca. The third fungus is a species of *Phytophthora* found in Selangor; it differs in culture from *P. faberi* in that it produces a more abundant aerial mycelium and forms sporangia and chlamydospores only after the lapse of some time (usually 14 days), and then only sparingly. Marked differences were also noted in the length and in the ratio of length to width of the spores of the two species, and finally the Selangor fungus failed to produce oospores when grown in mixed cultures with *P. palmivora*, *P. faberi* from black stripe of rubber, or the cacao strain of the latter fungus from Trinidad. The black stripe fungus formed oospores when grown with *P. palmivora*. Inoculation experiments on *Hevea* trees in 1927 indicated that the fungus isolated from patch canker causes more serious patches than the black stripe fungus, and the latter causes more black stripe than the former.

Towards the end of 1927 the author found some diseased *Hevea* pods, which had been produced late in the season. He obtained from them a species of *Phytophthora* which in his cultures produced abundant oospores of the *P. parasitica* type, and also a fair quantity of sporangia and a few chlamydospores. Measurements of sporangia on potato-dextrose agar gave a mean length of 42·98 μ and a mean width of 28 μ, while the mean diameter of the oospores was found to be 19·4 μ. It is mentioned that when cultured in England, the fungus produced oospores of a mean diameter of 21·1 μ on potato-dextrose agar and of 22·5 μ on maize agar.

In regard to the species of *Phytophthora* isolated in 1926 from a wilt of betel vine (*Piper betle*) in Malaya [ibid., vii, p. 383], the author states that although in Malaya it never produced oospores in culture, a culture of it sent to the Imperial Bureau of Mycology in England formed oospores in fair numbers on maize, bean, and oat agar. The oospores were of the '*parasitica*' type, but much larger than those of *P. parasitica* Dastur. When first obtained in Malaya, the fungus produced sporangia, many of which formed zoospores on germination, but after a few months in culture, zoospores were not produced and the sporangia germinated by germtubes. When grown in England, however, active zoospores were easily produced. The fungus recently described by Dastur as parasitic on *P. betle* [*R.A.M.*, vi, p. 579] appears to have some points in

common with the Malayan species, particularly in the germination of the sporangia.

MOEHRKE (LUZINDE). **Beiträge zur Kenntnis von Uromyces-Arten auf Euphorbia.** [Contributions to the knowledge of *Uromyces* species on *Euphorbia*.]—*Bot. Arch.*, xviii, 5–6, pp. 347–377, 6 pl., 1 map, 1927. [English summary.]

The aecidial stage of *Uromyces pisi* f. *viciae craccae* on *Euphorbia cyparissias* was found to differ in various particulars from the ordinary aecidial form of *U. pisi* from peas occurring on the same host [*R.A.M.*, iii, p. 498]. The malodorous spermogonia of the latter occur only on the under side of the leaves, while those of the former, which smell of honey, are found on both leaf surfaces. The aecidia of *U. pisi* are pale reddish-orange, while those of *U. pisi* f. *viciae craccae* show a more intense coloration. The foliage on shoots infected by *U. pisi* is unusually thick and broad, sometimes heart-shaped, in contrast to the small, narrow, but not strikingly abnormal leaves of the plants attacked by *U. pisi* f. *viciae craccae*. The pea rust frequently attacks the inflorescences of *E. cyparissias*, whereas in plants infected by the form from *Vicia cracca* flowering shoots do not appear to develop. The latter form is less widely distributed in the Rhine and Main Valleys than *U. pisi*.

The fasciation commonly occurring in the shoots of *E. cyparissias* is believed to be due to infection by *U. pisi*, which is further responsible for the development of 'foliations', i. e., small branches bearing stunted flowers. The other types of deformation of the host resulting from the infection with the fungus are discussed in some detail. Earlier investigators have reported that infected plants are capable of outgrowing the infection, but this appears to be due rather to the effect of drought than to an accelerated rate of growth, the fungus being killed by want of water and the infected organs of the host drying up and dropping off.

Notes are also given on the infection of various species of *Euphorbia* by other rusts and on the morphological characters of the latter.

HAIGH (J. C.). **Macrophomina phaseoli (Maubl.) Ashby. The pycnidial stage of Rhizoctonia bataticola (Taub.) Butler.**—*Trop. Agriculturist*, lxx, 2, pp. 77–79, 2 pl., 1928.

The recent discovery by Small in Ceylon of a stem blight of beans (*Phaseolus vulgaris*) caused by *Macrophomina phaseoli* [*R.A.M.*, vii, p. 62] leads the author to believe that a careful search would reveal further occurrences of the pycnidial stage of *Rhizoctonia bataticola* on some of the jungle plants in Ceylon. If his belief is justified, this would explain the wide occurrence of the latter on cultivated plants in the island, since the nature and method of growth of the fungus render it extremely unlikely that it spreads by actual mycelial growth, and the distribution of infective material by human or animal agency is only of secondary importance.

A brief description is also given of pycnidia observed by the author in an old, drying-out culture on maize meal from a single pycnospore of *M. phaseoli* from beans. These pycnidia were larger and more elongated than those found in nature and showed distinct

traces of a stromatic origin, but the discussion of the bearing of this fact on the systematic position of the fungus is left until further observations can be made. They contained normal pycnospores, which gave pure growths of the *Rhizoctonia* stage when subcultured.

PAINTIN (RUTH D.). **Notes on the parasitology of Sclerotium rolfsii.**—*Mycologia*, xx, 1, pp. 22–25, 7 figs., 1928.

The author states that *Sclerotium rolfsii* [*R.A.M.*, vii, p. 48], previously reported as parasitic on about one hundred and forty species and varieties of flowering plants, including maize, wheat, cotton, rice, and tobacco, especially in the south-eastern United States, was found by her in soil inoculation experiments in the greenhouse to be parasitic on 28 fresh hosts, including turnip, vegetable marrow, castor, cowpea, and barley.

Contrary to the observation of Edson and Shapovalov [ibid., ii, p. 389] that hyphae of *S. rolfsii* usually do not enter the host tissue directly, but that a disorganization due to digestive enzymes first takes place, the author states that, in general, the hyphae enter the epidermal cells in a mass, grow abundantly through the cortex both inter- and intracellularly, and cause very severe infection. Abrasion or wounding of the host is not necessary for infection, and penetration is accomplished either directly or by dissolution of the cell wall. A single hypha, however, was observed to have entered through a hair cell into the cortex of the stem of cowpea; also, single, intercellular hyphae, which dissolved the middle lamellae, were observed to have passed through the walls into the cells.

The mycelium was seen in the stele of the crown of cowpea and velvet bean [*Stizolobium deeringianum*] seedlings, where the hyphae travelled into the stems and roots. The fungus frequently caused complete disintegration of the central cylinder. Initially, the cortex is usually the most severely invaded part. The hyphae, which may be constricted, often exert considerable pressure, distending the cell walls.

THOMPSON (A.). **Notes on Sclerotium rolfsii Sacc. in Malaya.**—*Malayan Agric. Journ.*, xvi, 2, pp. 48–58, 2 pl., 1928.

In this paper the author gives notes on the symptoms caused by strains of *Sclerotium rolfsii* on the following hosts in Malaya: Jerusalem artichoke (*Helianthus tuberosus*) [*R.A.M.*, v, p. 79], rice, betel vine (*Piper betle*), and *Caladium* sp.

Artichokes are severely attacked by the fungus, which causes a wilt due usually to infection in the region of the collar. Later on the roots and tubers are rotted, and the rot may even injure the latter subsequent to digging. On rice seedlings infection causes yellowing and death of the shoots, sometimes only the leaf sheaths being attacked. On betel pepper the attack is at the base of the vine and causes wilting and a hollowing out of the pith of the first internode, resulting in the collapse of the vine. *Caladium* is infected on the tubers and bases of the leaves.

The fungus was isolated from each host and the cultural characters and infectivity compared. The strains from artichoke and *Caladium* appear to be identical, and cross-inoculations between

these two hosts were successful. Both also infected betel pepper, but the strain from the latter attacked rice while the other two did not. The strain from rice infected betel pepper but failed to injure the other two hosts. Details are given of the cultural characters of the strains, and the sclerotia from each host are described. Control measures are also briefly discussed.

ARNAUDI (C.). **Ueber die Penicillien des Gorgonzolakäses.** [On the *Penicillium* species of Gorgonzola cheese.]—*Centralbl. für Bakt.*, Ab. 2, lxxiii, 15–23, pp. 321–331, 2 figs., 1928.

In continuation of his previous investigations at the Serotherapeutical Institute at Milan on the use of pure cultures of *Penicillium* in the manufacture of Gorgonzola cheese [*R.A.M.*, vii, p. 62], the writer made some further serodiagnostic and biochemical studies with *P. biourgei* (the Latin diagnosis of which is given) and with 14 isolations of *P. weidemanni* var. *fuscum.* Six distinct strains of the latter were recognized. The differences previously observed between these species and strains were maintained, and preliminary experiments in their application for technical purposes gave very encouraging results.

TUNSTALL (A. C.). **Vegetable parasites of the Tea plant** (**continued**). **The blights.**—*Quart. Journ. Indian Tea Assoc., 1927*, pp. 173–182, 1928.

In continuation of his previous paper on tea blights [*R.A.M.*, vii, p. 275], the writer describes in popular terms the symptoms, life-history, distribution, and control of blister blight (*Exobasidium vexans*), copper blight (*Laestadia camelliae*), and shot hole (*Cercospora theae*).

TUNSTALL (A. C.). **The influence of plucking on the susceptibility to common fungus diseases of Tea leaves.**—*Quart. Journ. Indian Tea Assoc., 1927*, pp. 187–188, 1928.

The results of comparative estimates of the amount of infection by red rust [*Cephaleuros parasiticus*], brown blight [*Glomerella cingulata*], and grey blight [*Pestalozzia theae*] on the plucking plots at Tocklai in 1922 showed that the plots giving the highest yield had generally the highest percentage of infection. The proportion of diseased leaves was, however, insufficient to cause serious loss, the causal organisms being adequately controlled by annual pruning and spraying. So far the yield has not been appreciably affected by the occurrence of the diseases in question.

TUNSTALL (A. C.). **The influence of manuring on susceptibility of Tea leaves to brown blight (Glomerella cingulata) at Borbhetta.**—*Quart. Journ. Indian Tea Assoc., 1927*, pp. 183–186, 1928.

Rim blight [associated with *Alternaria*, *Cladosporium*, and other fungi : *R.A.M.*, vii, p. 275] was very severe in 1927 on young tea plants in the Borbhetta district [north-eastern India]. About the middle of August, five months after spraying with lime-sulphur, brown blight (*Glomerella cingulata*) appeared on some of the plots. This disease was particularly injurious on some plots of Burma tea,

planted in 1920 and covering four acres, which had been manured with large dressings of nitrogen (up to 120 lb. per acre) in combination with potash and phosphoric acid. In another set of plots heavy dressings of potash (198 lb. per acre) increased the susceptibility of the bushes to *G. cingulata* in comparison with those receiving phosphoric acid. Both nitrogen and potash, however, substantially increased the yields of the manured plots. Heavy doses of phosphoric acid, on the other hand, caused increased susceptibility to *Thyridaria tarda* [*Botryodiplodia theobromae*].

Petch (T.). **The parasitism of Tea root disease fungi.**—*Tea Quarterly*, i, 1, pp. 10–15, 1928.

This article is published in the first number of the *Tea Quarterly —The Journal of the Tea Research Institute of Ceylon.* Notes are given in popular terms on the history, distribution, and effects of common root diseases of tea caused by *Poria hypolateritia*, *Fomes lamaoensis*, *Ustulina zonata*, and *Rosellinia arcuata*, with observations on the technique of culture and inoculation experiments and some general information on the mode of infection of these fungi.

G[add] (C. H.). **Sphaerostilbe repens.**—*Tea Quarterly*, i, 1, p. 16, 1928.

Referring to Tunstall's observations on the frequent occurrence of *Sphaerostilbe repens* on tea in north-east India [*R.A.M.*, vii, p. 275], the author states that, while this fungus is by no means uncommon in Ceylon, its presence on tea is extremely rare. It is often found as a saprophyte on felled dadap [*Erythrina*] logs, &c. and is known to cause root disease in several cultivated plants e. g., *Hevea* rubber, papaw, cacao, and arrowroot [*Maranta arundinacea*]. On the roots of living plants, *S. repens* is invariably associated with a diseased condition and is a facultative parasite, the epiphytic state mentioned by Tunstall being unknown in Ceylon. Poor aeration and waterlogging of the soil favour the development of the parasitic habit in Ceylon, as in India, but there is little probability of serious damage from this fungus where tea is grown under suitable conditions.

Bertus (L. S.). **A dieback of Tea seedlings.**—*Trop. Agriculturist*, lxx, 2, pp. 80–84, 1 pl., 1928.

A brief morphological and cultural account is given of a fungus which was found in 1927 causing a die-back of one-year-old tea seedlings in the Kalutara district of Ceylon. The leaves of diseased shoots showed brown patches and on their lower surface bore a thin, powdery, white or greyish film of mycelium formed of mesh-like, hyaline, septate, irregularly swollen and branched hyphae, 4 to 7 μ in diameter, among which occurred barrel-shaped cells resembling spores and sometimes disposed in chains. This mycelium originated from fine hyphae which ran along the stems and united into a weft at the leaf axils. In pure culture on maize meal agar the fungus produced purple-brown or brown sclerotia from 0·5 to 4 mm. in diameter, which frequently coalesced to form irregular masses, and which very closely resembled the sclerotia formed by

a strain of *Corticium vagum* [*C. solani*] from groundnuts on the same medium. For this reason the author regards the tea fungus as a strain of *Rhizoctonia solani*, although when tested on known host plants of the latter it gave negative results. Tested on tea plants, the fungus was found capable of attacking the young leaves and shoots of the tea bush, but not older stems. A strain of *R. solani* isolated from *Vigna oligosperma* was found to be non-pathogenic to tea seedlings when brought into contact with their stems at ground-level, whether with or without wounding the stems.

Control of the fungus in tea nurseries should consist in the pruning of all diseased shoots back into healthy tissue; the destruction by fire of all prunings, diseased leaves, and of all debris from the infected plants on the ground. All plants in the infected area should also be thoroughly sprayed with Bordeaux mixture. Watering the soil with a strong solution of a disinfectant is recommended to kill the sclerotia present on the surface of the soil.

GIBSON (W.). **Black shank.**—*Nyasaland Times*, xxxi, 25, p. 4, 27th March, 1928.

A disease of tobacco due to a species of *Pythium*, and causing symptoms resembling those of black shank [*Phytophthora nicotianae*] in Sumatra and the United States [*R.A.M.*, vi, p. 442; vii, p. 277], is stated to be causing considerable damage in the Zomba district of Nyasaland. Infection is believed to originate in the seed-bed and the measures suggested for the control of the disease include the reduction of watering and shade in the nurseries; spraying the seedlings with Bordeaux mixture; drainage of the tobacco fields so as to avoid waterlogging; removal and burning of all diseased plants, prunings, and stumps; and at least two years' rotation before again using the affected fields for tobacco.

WOLLENWEBER (H. W.). **Ueber Verschimmelung bei Zigaretten.** [On mouldiness of cigarettes.]—*Mitt. Gesellsch. Vorratsschutz*, iv, 2, pp. 21–23, 5 figs., 1928.

Of recent years samples of cigarettes have been found to be affected by mouldiness caused mainly by *Aspergillus glaucus*, which infects the tobacco leaves during the curing process and develops under damp, warm conditions of storage. Other fungi causing similar damage include *Rhizopus nigricans*, *Penicillium glaucum*, *Botrytis cinerea*, *Sclerotinia libertiana* [*S. sclerotiorum*], *Mucor* sp., and *Alternaria* sp. *A glaucus* and *P. glaucum* cause a disorganization of the tissues and impair the aroma and taste of the tobacco, while *B. cinerea* may even produce a rotting of the leaves during the curing process. Any attempt to prevent infection of this type by the use of preservatives is likely to encounter widespread opposition, and the most promising method of preventing mouldiness appears to be the progressive improvement of selection of the raw material and of the processes of manufacture and storage.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

APPLIED MYCOLOGY

VOL. VII SEPTEMBER 1928

BLANCHARD (E. E.). **Principales insectos y enfermedades que perjudican el cultivo de la Yerba Mate.** [Chief insects and diseases detrimental to the cultivation of Yerba Mate.]—*Min. Agric. Nac. (Buenos Aires) Secc. Prop. e Inform. Circ.* 735, 42 pp., 4 col. pl., 2 figs., 1 diag., 1928.

Notes are given in popular terms on the principal diseases of yerba mate [*Ilex paraguensis*]. Various species of fungi (*Pythium*, *Rhizoctonia*, *Phytophthora*, &c), attack the seedlings, chiefly in compact soil under humid conditions; directions are given for their control by steam sterilization, disinfection of the seed-beds with 0·5 to 1 per cent. formalin, and spraying the plants with 0·25 per cent. Bordeaux mixture, in addition to the usual cultural measures.

Considerable damage is caused by 'measles' (*Peckia mate* Speg.), which produces on the upper side of the leaves innumerable black spots and may involve curling and desiccation of the foliage in severe cases. Anthracnose or white spot (*Colletotrichum yerbae* Speg.) is characterized by the presence of irregular white to ashen-grey spots on the upper side of the leaves (brown on the lower surface), measuring 0·5 to 1·5 cm. in diameter. Brown spot (*Cercosporina mate* Speg.) appears on the upper leaf surface in the form of circular, dark brown lesions with ashen-grey centres and brownish-purple margins, 0·5 to 1 cm. in diameter; on the lower side the spots are brown with a very pale border. This fungus, which was first observed in 1908, may cause heavy damage, especially to the leaves of branches growing close to the soil. *Phyllosticta yerbae* and *P. mate* Speg. both produce leaf spots, which in the former attain a diameter of several centimetres while those of the latter do not exceed 0·5 cm. *Phaeomarsonia yerbae* Speg. causes the development, mostly near the base of the leaf, of ashen-grey spots resembling those due to *Phyllosticta mate*, from which they differ, however, in the possession of prominently raised margins. The affected portions of the epidermis fall out, leaving translucent cavities in the leaf tissue. *Cercospora yerbae* Speg. may be recognized by the appearance of circular black spots, up to 0·5 cm. in diameter, with slightly sunken centres, on both leaf surfaces. The control of all these leaf diseases should be based on sanitary practices, the foremost of which is the destruction of all infected

material, supplemented by spraying with calcium polysulphide or Bordeaux mixture as directed in the concluding section of the paper.

Sooty mould (*Meliola yerbae* and *Paracapnodium pulchellum* Speg.), associated with scale insects and aphids, may be controlled by the ordinary measures directed against these pests. Black leaf (*Asterina mate* Speg.) resembles the foregoing, but the sooty crust only covers a portion of the leaf and does comparatively little damage.

White disease, recently observed in Misiones for the first time and attributed to a Myxomycete, is characterized by the formation, on the upper side of the leaves, of minute white pustules which give the foliage the appearance of having been dusted with finely divided lime. Little damage has so far been caused by this affection, which could, if necessary, be treated by the measures recommended above.

In some districts of Misiones *I. paraguensis* is liable to a disease known as black rot or necrosis, which begins with the formation of minute, orange-yellow (later greenish) spots on the leaves of the lower branches and gradually spreads upwards. In advanced stages the leaves and stems present a shiny, black surface, and in severe cases the infected foliage is shed, to be replaced by new shoots from the terminal branches about the middle to the end of February. One- to three-year-old plants suffer more acutely from black rot than older ones, and the disease occurs with particular intensity in stony, shallow soils. The damage caused by black rot is estimated at 50 per cent. in severe cases.

Dry rot may be recognized by the formation, on the trunk and branches, of deep cankers which become covered with fungi of the genus *Stilbum*. This disease appears to be associated exclusively with poor soil conditions.

Wet rot, which attacks four- to six-year-old trees, involves premature decline and general chlorosis. The number and size of the leaves are reduced, the branches are short and slender, finally becoming desiccated and black at the tips, and the roots are decayed and covered with a greyish mould. This disease also occurs under unsuitable soil conditions.

BÖNING (K.). **Krankheiten des Tabaks.** [Tobacco diseases.]—*Arb. Bayer. Landesanst. für Pflanzenbau und Pflanzenschutz*, 4, 40 pp., 9 figs., 1928.

The first section of this paper is separately noticed from another source [see next abstract]. The second part deals at greater length with the diseases enumerated as occurring in Bavaria during 1927, bibliographical references being given in each case.

Sclerotinia sclerotiorum develops best at a temperature of 18° to 22° C. The length of time required for the germination of the sclerotia was found to vary from two to four months, but they may preserve their capacity to germinate for a period of several years. It is thought that *S. nicotianae*, hitherto reported only from Holland, may also be involved in the causation of sclerotial disease in Bavaria. Control measures should be based on the exclusive use of healthy seedlings combined with the destruction by burning

or burying with quicklime of diseased plants before they have time to form sclerotia, appropriate cultural measures [which are indicated], and crop rotation. In order to prevent losses after harvest, when the leaves are drying or hanging in the barns, strict precautions should be taken to avoid contact between diseased and healthy leaves, and arrangements should be made for abundant ventilation to accelerate the drying process. In no case should the harvested leaves be kept long in the open or in unprotected situations, well-ventilated barns being far preferable.

Tobacco flowers are frequently attacked by grey mould (*Botrytis*) [? *cinerea*], which may drop on to the leaves with the infected corollas and cause a decay of the foliage both of *Nicotiana tabacum* and *N. rustica* [cf. *R.A.M.*, v, p. 611]. This fungus may also cause a form of barn rot.

Kotte's and Kern's investigations in connexion with bacterial blight (*Bacterium tabacum*) [ibid., vii, pp. 65, 124, 125], which is stated to have been observed in the Palatinate since 1922, are described, and some recommendations, based on recent American work, made for the control of the disease. Infection experiments carried out at Madison, Wisconsin, with specimens sent from Germany have, according to reports received from Johnson, given rise to the typical symptoms of wildfire, so that the identity of the disease in both countries is practically certain. In August, 1927, the disease caused considerable damage in various places following heavy rains. When travelling in the Schwabach district the writer observed that *N. rustica*, which is apparently immune from wildfire, was slightly infected by a disease resembling angular leaf spot (*Bact. angulatum*).

An extensive disorganization of the medulla and cortex frequently accompanies the 'stripe and curl disease' or 'mauche' [ibid., vi, p. 128], which is characterized by long, sometimes discontinuous, brown stripes on the stems, petioles, and veins, and by curling and necrotic spots of the leaves. This disease, various types of which may be distinguished, has become increasingly serious in the Palatinate in recent years. Investigations have shown that it is infectious, the causal organism occurring in the soil and attacking the seedlings from the earliest stage. Secondary infection takes place through contact between the leaves or stems of young plants and the infested soil, as well as in topping and priming operations of the older plants in the field.

Stem or rib scorch of *N. rustica* somewhat resembles the foregoing, from which it differs, however, in the broader dark brown, necrotic stripes on the affected organs and in the absence of distortion and necrosis of the leaves. The disease may cause heavy damage by obstructing the water supply and thereby involving the desiccation of the infected parts. The condition appears to be of non-parasitic origin and occurs primarily in very damp sites. Careful attention to drainage is indicated.

The symptoms of tobacco mosaic are described, with observations on the mode of transmission and control of the disease.

[The sections of this paper dealing with stripe and curl disease and stem or rib scorch are printed as a separate article in *Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, viii, 5, pp. 39–42, 1928.]

[BÖNING (K.).] **Bericht über das Auftreten von Krankheiten und Schädlingen am Tabak im Jahre 1927.** [Report on the occurrence of disease and pests on Tobacco in the year 1927.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, v, 2, pp. 280–285, 1928.

This account of the diseases and pests of tobacco occurring in Bavaria during 1927 is based partly on the reports of the tobacco cultivation station, and also on visits of inspection paid to the various districts where this crop is grown. The total loss from these causes is calculated at about 33 per cent., representing a financial value of roughly M. 2,000,000.

The dying-off of seedlings, caused by *Pythium de Baryanum* and other agents, is very prevalent in the Palatinate. Cases of infection by *Thielavia basicola* have also been reported from this region, but so far the root rot fungus appears to be of subsidiary importance.

The damage caused by bacterial blight [*Bacterium tabacum*: see preceding and following abstracts] is estimated at 10 to 20 per cent. with a resulting financial loss of nearly M. 1,000,000. Satisfactory control is said to have been achieved in a number of localities by spraying with Bordeaux mixture.

The incidence of the sclerotial disease [*Sclerotinia sclerotiorum*: ibid., vi, p. 128] shows a marked decline in the Palatinate, but up to 100 per cent. infection was observed on *Nicotiana rustica* at Roth near Nürnberg. This fungus also led to heavy losses (15 per cent.) from a form of barn rot which it caused in harvested tobacco under unfavourable conditions.

A disease formerly known in Baden as 'mauche' [scab: see preceding abstract] but better described as 'stripe and curl disease' (including 'curly dwarf' and 'curly heart') occurred in the Palatinate, attacking 20 per cent. of the crop in a plantation near Kandel.

N. rustica suffered from a disease known locally in the Schwabach district as 'stem or rib scorch', the loss from which is estimated at 10 per cent.

Various leaf spots, including the small white spotting due to *Phyllosticta tabaci*, were of minor importance during the period under review.

WÜRTENBERGER (W.). **Der Bakterienbrand des Tabaks.** [Bacterial blight of Tobacco.]—*Mitt. Deutsch. Landw. Gesellsch.*, xliii, 12, pp. 271–272, 1 fig., 1928.

A popular account is given of the bacterial leaf spot of tobacco recently reported from Baden and stated by Kotte [*R.A.M.*, vii, p. 124] to be caused by *Bacterium tabacum*. Control measures on the lines of those employed in the United States are indicated.

PATEFF (P.). **Wildfire,** една нова бактерийна болесть по листата на Тютюна въ Българня. [Wildfire, a new bacterial leaf spot disease on Tobacco in Bulgaria.]—*Rev. Inst. des Recherches Agron. en Bulgarie*, iv, 3, pp. 101–112, 4 pl., 1928. [English summary.]

A brief account is given of a widespread outbreak in 1923 in

Bulgaria of a leaf spot disease of tobacco which occasioned heavy losses to the local growers, and the symptoms of which entirely agreed with those of specimens of tobacco wildfire received from the United States [see preceding abstracts]. The organism isolated from diseased material agreed very closely with the description of *Bacterium tabacum*, except in the number of flagella (1 to 6 polar flagella in the Bulgarian organism) and in some minor cultural characters, details of which are given. According to the author's determination, the group number of his bacterium is 211.2222032. It is pointed out, however, that some American authors have described *Bact. tabacum* as possessing more than one flagellum [*R.A.M.*, ii, p. 39], so that the possibility of identity between the American and the Bulgarian organisms is not excluded. The author was not able to clear up this point, because the cultures which were sent him from America perished on the way.

No exact data are stated to exist of the first occurrence of the disease in Bulgaria, but among the exsiccata of the Agricultural Experiment Station at Sofia there are specimens dated 1915 of tobacco leaves clearly showing the symptoms of the disease, thus indicating that it is already of fairly long standing in that country. In this connexion the author refers to Cavadas's discovery of wildfire in Macedonia in 1924 [ibid., iv, p. 449], and to the recent papers by Kern and Kotte recording its occurrence in Hungary and in Germany, respectively [ibid., vii, pp. 65, 125]. It is also stated that the photographs given by Jaczewski of the tobacco disease known in Russia as pox or speckled disease, in his 'Fungous, bacterial, and functional diseases of tobacco' (*G.U.Z.Z. Bureau of Mycology and Phytopathology of the St. Petersburg Scientific Committee*, 1914), do not leave any doubt that this disease, which has apparently been known in Russia for a good many years, is wildfire.

The paper terminates with recommendations for the control of the disease, chiefly based on the work of American authors, and a bibliography of 25 titles is appended.

DUFRÉNOY (J.). **La maladie de l'encre du Châtaigner.** [The ink disease of the Chestnut.]—*Actes 1^er^ Congr. Internat. de Sylvicult.*, v, pp. 299–300, 1926. [Received May, 1928.]

The strains of the causal organism of the ink disease of chestnuts, *Blepharospora* [*Phytophthora*] *cambivora*, isolated from Corsican material readily form zoosporangia in mineral solutions, like the Italian strains. Those from central France, on the other hand, are more inclined to form chlamydospores.

Cytological observations have shown [*R.A.M.*, v, p. 586] that, as in the Saprolegniaceae, the mitochondria are elongated in the vegetative hyphae and become rounded in the zoosporangia.

Seedlings of *Castanea vesca* are readily killed either by inoculation with *P. cambivora* or by cultivation in infected soils. On the other hand, the lesions induced by the fungus in *C. crenata* and *C. mollissima* undergo cicatrization. The examination of some of the thousands of young Japanese chestnuts, imported into France four years ago and now distributed among the plantations devastated by the ink disease, shows that the fungus is able to penetrate

the cortex of the roots to the depth of a few cell layers, but the lesions become almost completely healed. The Tamba variety, characterized by its large fruits, is specially recommended for planting.

CIFERRI (R.). **Dominican Republic: a disease of the Mulberry new to the country.**—*Internat. Bull. Plant Protect.*, ii, 2, p. 18, 1928.

The leaves of mulberries (*Morus* spp.) growing in young plantations near the National Agronomic Station at Moca are suffering serious damage from a bacterial disease, probably due to *Pseudomonas* [*Bacterium*] *mori* [*R.A.M.*, iv, pp. 73, 398] not hitherto identified in the Dominican Republic. Arrangements are in progress for the partial defoliation of the trees and the burning of infected leaves.

TAKIMOTO (S.). **A bacterial disease on Mulberry and its causal organism.**—*Bult. Sci. Fak. Terkult. Kjuŝu Univ.*, ii, pp. 317–323, 1927. (Japanese, with English *résumé*.) [Abs. in *Japanese Journ. of Botany*, iv, 1, p. (27), 1928.]

A very prevalent mulberry disease in parts of southern Japan is characterized by polygonal or irregular, water soaked, later brown spots on the leaves, which are sometimes deformed. Subsequently black streaks and cankers appear on the shoots and branches. The disease has been traced to the action of white bacteria identified as *Bacterium mori* [see preceding abstract], with which innocuous yellow organisms are constantly associated.

SREENIVASAYA (M.) & SASTRI (B. N.). **Contributions to the study of spike-disease of Sandal (Santalum album, Linn.). Part I. Diastatic activity of the leaves.**—*Journ. Indian Inst. Sci.*, xi A, 3, pp. 23–29, 2 graphs, 1928.

In the course of detailed investigations of the various enzymes of sandal (*Santalum album*) tissues in Mysore, the writers consistently found higher diastatic activity in leaves infected by spike disease [*R.A.M.*, vi, p. 66] than in healthy ones. This is in contradiction to Coleman's conclusion that the diastatic activity of spiked foliage was lower than that of the healthy. On the other hand, his statement that the spiked leaves are comparable in composition with young, healthy leaves was verified, both in respect of their chemical constituents and diastatic activity.

The samples of leaves used in this examination were collected between 8.30 and 9.30 a.m. near Bangalore. The method of preparing this material for analysis and of estimating the diastatic activity of the expressed sap and leaf-powders is briefly described.

The results of the experiments [which are tabulated] showed that in every case the diastatic activity of the saps and powders from spiked leaves was higher (up to four times) than that of the healthy samples. Colour reactions with iodine confirmed these data. An almost entire absence of any gradient characterized the diseased leaves, while in healthy ones there was a steady fall in diastatic activity from the growing tip downwards. The higher

diastatic activity of the spiked leaf extract was also strikingly shown by a study of the time-course of diastatic action. Whether these results indicate differences in the absolute amount of diastase or are explicable by the presence of inhibitors or activators in the respective samples is uncertain, but the curves point to a definitely lower enzyme concentration in the healthy leaf extract. In addition to a higher enzyme concentration in the spiked leaf extract, the lower P_H value (4·7), approximating to the optimum reaction of plant amylases, the lower calcium content, and the higher amino-nitrogen figures for the diseased leaf extract, possibly contribute to the activation of the enzyme derived from the spiked leaf.

COSTILLA (M. A.). **Principales enemigos y enfermedades de las repoblaciones en España. Necesidad de ampliar los medios de defenso en relación con el aumento de las repoblaciones.** [Principal pests and diseases in the reafforested areas of Spain. Necessity of extending control methods in connexion with the increase of reafforestation.]—*Actes 1er Congr. Internat. de Sylvicult.*, iv, pp. 451–454, 1926. [Received May, 1928.]

Serious damage is caused to conifers in the reafforested areas of Spain by *Lophodermium pinastri* (good control of which has been given by 2 per cent. Bordeaux mixture) [*R.A.M.*, vii, p. 349]; *Peridermium pini* [f.] *corticola* [ibid., vi, p. 201]; and (to *Pinus halepensis*) by *Bacterium vuillemini* or *Bacillus pini* [ibid., iv, p. 514]. Brief indications are given for the extended control of these diseases and of insect pests.

WEIS (F.) & NIELSEN (N.). **Nogle Undersøgelser over Rodfordærversvampen (Polyporus radiciperda).** [Some investigations of the root-destroying fungus (*Polyporus radiciperda*).] —*Dansk Skovforen. Tidsskr.*, pp. 233–246, 1927. [Abs. in *Bot. Centralbl.*, N.F., xii, 9–10, p. 285, 1928.]

The growth of *Polyporus radiciperda* [*Fomes annosus*] was investigated in malt extract cultures of varying hydrogen-ion concentrations, and the most favourable P_H value was found to be 4 to 4·5: this conflicts with the results of Lagerberg and Melin who give P_H 6 as the optimum. The reaction of the medium shifts steadily towards the acid side during the growth of the fungus. It is pointed out that the average hydrogen-ion concentration of Danish conifer forest soils is about P_H 4, i. e., a reaction favouring infection by the root-destroying organism. The beneficial effect of thorough forest sanitation and removal of dead material is attributed to the reduction of the soil acidity resulting from these practices. Copper sulphate proved highly toxic to pure cultures of the fungus, the growth of which was inhibited by concentrations of 0·1 to 0·2 per cent.

RŮŽIČKA (J.). **O hnilobě lesních stromů.** [On the decay of forest trees.]—*Bull. Czecho-Slovak. Acad. of Agric.*, iv, 1, pp. 8–9, 1928. [German translation.]

In the author's opinion the widespread occurrence of the red rot

or root fungus [*Fomes annosus*] in the pine forests of Czecho-Slovakia (the annual loss caused by which is estimated at over £50,000), is primarily attributable to the asphyxiation of the roots of the trees due to excessive compactness of the soil, waterlogging, or the formation of moss or a coarse humus cover on the surface of the soil. He considers the fungus to be only a facultative parasite, incapable of attacking quite healthy trees, and believes that it can be easily controlled by general forest sanitation and drainage measures, which are briefly described.

WILSON (M[ARY] J. F.). **A disease of the Douglas Fir and other conifers.**—*Gard. Chron.*, lxxxiii, 2146, p. 105, 2 figs., 1928.

Recent investigations have shown that the fungi commonly described as *Dermatea livida* B. et Br. on pines are not all identical, but may be divided into two groups according to the size of the ascospores. Those with the smaller ascospores (to which all records of parasitism apparently refer) do not agree with any previous description, and will probably have to be given a new name. The conidial stage of this fungus was found by cultural work to be *Myxosporium abietinum*, described by Rostrup as a parasite on Sitka spruce [*Picea sitchensis*], European larch [*Larix europaea*], and Douglas fir [*Pseudotsuga taxifolia*].

D. eucrita Karst. has been reported as a parasite on *P. sitchensis* in eastern Germany and on Douglas fir in Holland. However, on examining the Dutch trees in September, 1927, the writer found no definite evidence of parasitism, and negative results were also given by inoculation experiments on *Pseudotsuga taxifolia* and Norway spruce [*Picea excelsa*] with the same fungus from *P. sitchensis* twigs injured by frost near Newcastle.

D. livida proper appears to be purely saprophytic and has been found only on dead branches of Scotch pine (*Pinus sylvestris*). It forms a *Myxosporium* stage in culture. Inoculation experiments with this organism on *P. sylvestris* and *Picea excelsa* have all given negative results.

The third fungus commonly identified with *D. livida* is *Scleroderris livida*, which was described as a parasite on *P. taxifolia* in Scotland in 1911. More recently it has been collected on *Cupressus lawsoniana*, *Abies nobilis*, and *P. taxifolia* in various parts of England and Scotland. In four out of the five cases reported the fungus was stated to be causing the death of the trees. The *Myxosporium* stage has been recorded as common on dying *P. taxifolia* trees planted in an unsuitable situation in the Forest of Dean, but no *Dermatea* was present in this case. A number of apparently vigorous *P. taxifolia* seedlings in a New Forest nursery are infected, and fructifications of both forms of the fungus occur on the bark. The *Myxosporium* stage has further been obtained from *A. nobilis* and *P. taxifolia* weakened by *Chermes* infection. Inoculation experiments with this fungus on *P. taxifolia*, *A. pectinata*, *C. lawsoniana*, and *Pinus sylvestris* have so far given negative results. Judging by field observations, however, it seems to be a weak parasite, and further experiments are in progress to determine the degree of its virulence.

BIOURGE (P.). **Cycle du Brunchorstia destruens, Eriks. Maladie des pousses du Pin d'Autriche.** [The cycle of *Brunchorstia destruens* Erikss. A disease of the shoots of Austrian Pine.]—*Bull. Soc. Centr. Forest. Belgique*, xxxv, 2, pp. 68–76, 19 figs., 1928.

The author states that certain of his observations of the die-back disease of *Pinus austriaca* caused by *Brunchorstia destruens* [*R.A.M.*, vi, p. 706; vii, p. 209] recently reported in Belgium from two widely distant cantons, Rochefort and Op-Glabbek, do not agree with those of Brunchorst in Norway. Thus, the killing of the leading shoot does not always check the growth of the tree, which may be resumed by shoots lower down. The walls of the hyphae were ashy-green instead of colourless, became nearly black when exposed to the air, and contained blackish refracting grains or masses of black matter. Fructifications were found on needles still attached to the tree, whereas Brunchorst states that they only occur on fallen needles. In the author's opinion, infection can take place through the stomata and the needles are not always invaded from the shoot.

Sorauer considered that *B. destruens* was the pycnidial stage of *Cenangium abietis*, and *Dothichiza ferruginosa* (the spores of which measure 8 by 4 μ) the spermagonial stage. From the latter view the author dissents, as he found on a dead terminal bud of *P. austriaca*, killed the same year by *B. destruens*, a bright red spermagonial form, the spermatia of which measured approximately 3 by 1·5 μ.

No ascigerous stage was found in the author's specimens.

In a footnote it is stated that Weir observed the complete life-cycle of *C. abietis* on *P. ponderosa* in Montana on both naturally and artificially infected material. The spermatia measured 7 by 3 μ, whereas those of the author's bright red spermagonia were only 3 to 4 by 1·5 to 2 μ, and generally contained one oil-drop. As it is unlikely that several authors should be mistaken about the dimensions of these spermatia the author considers that *B. destruens* may belong to a species of *Cenangium* other than *C. abietis*.

HAFIZ KHAN (A.). **Inoculation of Chir (Pinus longifolia) with Coleosporium campanulae (Pers.) Lév., on Campanula canescens Wall., and Coleosporium inulae (Kunze) Ed. Fisch., on Inula cappa DC.**—*Indian Forester*, liv, 3, pp. 176–178, 1928.

Since 1922 *Pinus longifolia* in the Dehra Dun district of the Himalayas has been heavily infected every year (especially in 1924) by *Peridermium complanatum*. In an attempt to find the alternate hosts of this fungus, inoculations were carried out on *P. longifolia* with the uredospores of *Coleosporium campanulae* from *Campanula canescens* and those of *C. inulae* from *Inula cappa* but gave negative results.

FERGUSSON (N.). **Some reflections on the preservation of timber.**—*Actes 1er Congr. Internat. de Sylvicult.*, iv, pp. 469–479, 1926. [Received May, 1928.]

This is an account of some recent developments in timber pre-

servation (chiefly against *Merulius lacrymans*) in the United States and Great Britain. Much useful information is presented concerning the various methods of impregnation in common use, with observations on the different purposes for which the treated wood is employed.

HAVELIK (G.). **La conservation du bois.** [The preservation of wood.]—*Actes 1er Congr. Internat. de Sylvicult.*, iv, pp. 455–468, 2 pl., 1926. [Received May, 1928.]

This is a survey of the nature and extent of the damage caused to structural timber by various wood-destroying fungi (chiefly *Merulius lacrymans*), and of the different methods of impregnation practised in Central Europe.

SHEVTCHENKO (V. M.). Про вплив **Cercospora beticola Sacc.** на Цукровий Буряк. [Influence of *Cercospora beticola* Sacc. on Sugar Beet.]—*Bull. Belaya Tserkov Plant Breeding Stat. of the Sugar Trust*, Kieff, i, pp. 160–175, 3 figs., 3 graphs, 1927. [English summary. Received May, 1928.]

In this report are embodied the results of observations and experiments made in 1924 and 1925 at the Plant Breeding Station at Belaya Tserkov [Ukraine] with a view to determining the effect of the infection of sugar beet with *Cercospora beticola* on the yield of the crop and on the development of the plants. In 1924, when the disease was more or less sporadic and very mild, observations showed that although the gross weight of the infected beet roots was reduced by 3·5 per cent., their sugar content was increased by 5·9 per cent. In 1925, on the other hand, the disease caused a heavy epidemic, and resulted in a reduction of the gross weight of the roots by 9 per cent., of the weight of the foliage by 46 per cent., and of the sugar content of the roots by 11 per cent. In plots sprayed with Bordeaux mixture, it was noted that *C. beticola* only attacked the mature leaves, while the young and over-mature ones remained immune from infection even when the spray did not reach them.

Among all the varieties of sugar beet tested only one, var. *plantaginifolia* Zalensky, remained practically immune from *C. beticola*, as only the oldest lower leaves bore a few very slight spots of the fungus.

MITRA (M.). **Gall formation on the roots of Mustard due to a smut (Urocystis coralloides Rostrup).**—*Agric. Journ. of India*, xxiii, 2, pp. 104–106, 2 pl., 1928.

In 1921 the [Indian] mustard [*Brassica campestris* var. *sarson*] crop in a small plot (100 sq. ft.) near Pusa was found to be attacked by the underground smut *Urocystis coralloides* [*R.A.M.*, vi, p. 208], which produced light grey to whitish, later greyish-black galls (up to 1·5 in. in diameter) on all parts of the root system. On examination the young galls were found to be full of inter- and intracellular mycelium, composed of thin-walled, septate hyphae with binucleate cells. Spore masses, consisting of one to four fertile cells and surrounded by an enveloping cortex of sterile cells, are

formed from the gelatinous or mucilaginous groups of hyphae. The central fertile cells are dark brown, with thick membranes, and measure 14·3 to 19·3 by 11·8 to 17·2 μ in diameter; the outer cells are lighter in colour. The whole ball measures 30·1 to 46·4 by 21·5 to 49·6 μ in diameter.

U. coralloides is stated to be a very rare fungus, which was first found by Rostrup on the roots of *Turritis glabra* in Denmark in 1881 (*Rev. Myc.*, iii, p. 32, 1881). It was subsequently observed at Palvas (Montpellier), on the roots of *Matthiola sinuata* (*Bull. Soc. Myc. France*, xv, p. 98, 1899). The present record, therefore, is only the third since the original discovery of the fungus. Attention is further drawn to the comparative rarity of gall-forming smuts, and some instances of their occurrence are enumerated.

Since the smut was first noticed near Pusa, the mustard crops in the affected plot have been attacked year after year, indicating that infection occurs through the soil. Several attempts have been made to germinate the spores of *U. coralloides* under laboratory conditions, but all have hitherto given negative results. Mustard sown in pots containing infected soil from the previous season developed galls on the roots in each of 20 pots tested, while in 30 pots containing clean soil to which spores were added, or sown with seed mixed with spores, no infection resulted.

DUFRÉNOY (J.). **Modifications des mitochondries et des plastides dans les cellules de feuilles de Haricots affectées de mosaïque.** [Modifications in the mitochondria and plastids of the leaf cells of Beans affected by mosaic.]—*Comptes rendus Soc. de Biol.*, xcviii, 5, pp. 373–374, 1 fig., 1928.

The plastids in the cells of the green portions of bean [*Phaseolus vulgaris*] leaves affected by mosaic present a normal aspect and stain readily with hematoxylin. The mitochondria occur in the shape of short filaments or rods. In the cells of the discoloured regions the plastids become progressively less sensitive to staining and the starch grains are absorbed. Both the plastids and mitochondria undergo a process of swelling and vacuolization. Similar modifications are stated to occur in the cells of bean leaves parasitized by *Colletotrichum lindemuthianum*.

DUFRÉNOY (J.). **Cytologie des cellules d'Oignon parasitées par le Peronospora schleideni.** [Cytology of Onion cells parasitized by *Peronospora schleideni*.]—*Comptes rendus Soc. de Biol.*, xcviii, 5, pp. 372–373, 1 fig., 1928.

In the immediate vicinity of the hyphae or haustoria of *Peronospora schleideni*, the chondriome of infected onion cells is represented by very short, concatenate rods which seem to be in process of division. Swelling and vacuolization also occur. The fungus shows a cytological structure very similar to that of *Saprolegnia* or *Blepharospora* [*Phytophthora*] *cambivora* [*R.A.M.*, v, p. 586]; the mitochondria and nuclei are most conspicuous in those portions of the mycelium developing in the host cells which preserve readily staining nuclei and chondriomes.

Reinhold & Schulz. **Schädlings- und Krankheitsbekämpfung in der Gurkentreiberei.** [Pest and disease control in Cucumber cultivation.]—*Obst- und Gemüsebau*, lxxiv, 2, p. 26, 1928.

Excellent control of leaf spot, fruit blight, and mildew of cucumbers (*Corynespora melonis*, *Cladosporium cucumerinum* [*R.A.M.*, vii, p. 6], and *Erysiphe martii* [*E. polygoni*], respectively), has been obtained in Germany by dusting with a preparation known as petebe (Chem. Fabrik G. m. b. H. Dr. Jacob, Kreuznach), which is also stated to be very effective against *Peronospora* of the vine [*Plasmopara viticola*]. The amount of the dust required for a greenhouse 30 m. in length is 1 kg. and the estimated cost M. 1 compared with M. 1·65 for spraying with the less effective Burgundy mixture. The Tip-top dusting apparatus (Gebr. Holder, Metzingen, Württemberg), which costs M. 38·50, has been found very efficient for this purpose.

Killian (C.) & Maire (R.). **Sur une nouvelle maladie des Artichauts et sur un champignon Diplodina cynarae qui l'accompagne.** [On a new disease of Artichokes and a fungus, *Diplodina cynarae*, which accompanies it.]—*Bull. Soc. Hist. Nat. Afrique du Nord*, xix, 1, pp. 20–23, 13 figs., 1928.

In this paper it is stated that the disease of artichokes (*Cynara scolymus*) previously reported from Algeria [*R.A.M.*, vi, p. 709] may possibly be a physiological condition resulting from forced cultivation under irrigation. Both healthy and diseased plants showed the presence of *Ramularia cynarae*, but this fungus is considered to play no part in the etiology of the disease. The weakened flower heads are killed off by *Diplodina cynarae* n.sp. ad interim, of which the morphological and cultural characters are described and a Latin diagnosis is given. The subglobose pycnidia, 200 to 300 μ in diameter, are sometimes confluent, and are provided with short beaks. The hyaline, uni- or bicellular, oblong-cylindrical, non-guttulate spores are not constricted at the septum and measure 7 to 12 by 2·5 to 3·5 μ.

Petri (L.). **Rassegna dei casi fitopatologici osservati nel 1927.** [Review of phytopathological records in 1927.]—*Boll. R. Staz. Pat. Veg.*, N.S., viii, 1, pp. 1–50, 4 figs., 1928.

In this report it is stated that a correlation was established between the indentation of the leaves in vines affected with 'roncet' or leaf roll [probably identical with court noué: *R.A.M.*, iii, p. 251] and the structures originally described by the author under the name 'cordoni endocellulari' [special intracellular formations of a nature similar to the cell walls, which form solid cordons traversing the cells in a given direction]. These bodies develop first in the cambium and then in the wood and cortex, and they have been observed in American non-grafted vines in Sicily, as well as in the young internodes of branches of diseased vines of the Rupestris du Lot variety.

Cycloconium oleaginum [ibid., vi, p. 627] was observed at the base of the petioles of olive leaves, where they joined the stem, and was apparently the cause of a severe leaf fall, greater than could be accounted for by the few spots found on the leaf blades. This

localization of the fungus is stated to occur only on fully grown leaves; young leaves, although they show characteristic spotting, do not fall.

Peach scab (*Fusicladium cerasi*) was found on fruit from Monte Libretti. The control measures recommended consist in pruning, cleansing the bark, the application of a strong solution of iron sulphate in winter, and spraying with 1 per cent. Bordeaux mixture before the buds open; ammoniacal solution of copper carbonate should also be applied in spring. Peaches in the vicinity of Rome were affected by *Sporotrichum persicae* Poll.

The non-parasitic silver leaf disease of peaches [ibid., vi, p. 395] was reported from an orchard on sandy soil near the sea at Viareggio. Similar physical soil conditions have not previously been reported in connexion with this disease. It is considered that the compactness and alkalinity of the soil (the P_H value of which is 8·2) may influence the condition. The intensity of the disease on the individual trees varies from year to year, and in some instances depends on progressive wood rot following pruning wounds.

Fusicladium orbiculatum Thüm. was found on the fruit of *Prunus* [*Pyrus*] *aucuparia* at Rodi, Apulia. The disease, which was first noted there five years previously, has now become prevalent throughout the vicinity.

Two forms of root rot of citrus [ibid., vi, p. 396] are found in southern Italy, one of which is due sometimes to *Phytophthora citrophthora* and sometimes to *P. parasitica* (this form is prevalent in Sicily), while the other is non-parasitic, and is due to excessive compactness of the soil and waterlogging. The latter form of root rot may be associated with secondary fungi, including *Fusarium limonis*, other species of *Fusarium*, and *Dematophora* [*Rosellinia necatrix*]. For the control of the parasitic form are recommended applications of phosphatic fertilizers, the sparing use of organic nitrogenous manures, and the addition of copper sulphate to the irrigation water. To prevent the non-parasitic form, thorough digging over and draining of the soil are advised.

Ascochyta quercus was observed on leaves of *Quercus ilex* from Monte Mario. *Sclerotinia pseudotuberosa* [ibid., iii, p. 5] was found on the acorns and *Physarum* [*nutans* var.] *leucophaeum* on the fallen leaves of *Q. ilex* at Rome.

A new outbreak of ink disease of the chestnut [*Phytophthora cambivora*: ibid., vi, p. 396] was reported in October 1927, from Cosio d'Arroscia (Imperia), and an outbreak of what may have been the same disease also occurred in the province of Ascoli Piceno.

As a result of preliminary investigations into root rot of mulberry, it is considered that the initial infection may occur in the collar. Among the fungi isolated from diseased mulberry roots was *Fusarium echinosporum* Sib., inoculations with which, however, gave negative results.

Carob trees (*Ceratonia siliqua*) in south-west Sicily were, 15 years ago, attacked by a disease which was at first confused with the mildew *Oidium ceratoniae* [ibid., iii, p. 181] but which became progressively worse, until in 1927 the crop in the affected area had fallen to one-fifth of the normal. White spots appear on the under surface of the leaves, and gradually darken and involve the upper

surface; subsequently the leaf falls. Leaves examined in March, 1927, bore no trace of mildew on the under surfaces, but *Phyllosticta ceratoniae* was found in the centre of the spots on the upper surfaces, and may possibly have followed an earlier mildew attack.

In the autumn of 1926 the plain of Alessandria was flooded, and the following April proved intensely cold; early in May the wheat crop in this area was so severely attacked by *Sclerospora macrospora* that it had to be ploughed up.

Broad beans (*Vicia faba*) near Rome were seriously attacked by *Sclerotinia libertiana* [*S. sclerotiorum*] in association with *Uromyces fabae*. In one district *Cercospora fabae* was also found on the same host, and in another *Ascochyta pisi* var. *fabae*. Lentils at Viterbo showed the presence of *S. sclerotiorum*, but without the formation of sclerotia, though abundant fructifications of its conidial stage, *Botrytis vulgaris* [*B. cinerea*], were observed. *Bacillus maculicola* [ibid., iv, p. 446] was found on tobacco from the Trentino.

BRAUN (K.). **Biologische Reichsanstalt für Land- und Forstwirtschaft, Zweigstelle Stade. Tätigkeitsbericht für die Zeit vom 1. April 1927 bis 31 März 1928.** [National Biological Institute for Agriculture and Forestry, Stade Branch. Report on the work carried out from 1st April, 1927 to 31st March, 1928.]—Reprinted from *Die Landwirtschaft*, 15–16 (*Beil. zum Stader Tagebl.*), 2 pp., 1928.

This report contains particulars of the general and scientific activities of the Stade [near Hamburg] branch of the Biological Institute during the period under review, together with a list of papers published by members of the staff in various periodicals. The following phytopathological items are of interest. The Graham's Jubilee and Cordes apple varieties proved highly resistant to scab (*Fusicladium*) [*Venturia inaequalis*], which occurred in epidemic form in the Lower Elbe district. Shot hole of cherries [*Clasterosporium carpophilum*] was very severe on trees growing in the marshes, whereas those on moorland and on high, dry ground remained quite healthy.

EGLITS (M.). **Latvia: plant diseases in the year 1927.**—*Internat. Rev. of Agric.*, N.S., xix, 4, p. 401, 1928.

Crown rust of oats (*Puccinia coronifera*) [*P. lolii*] caused serious damage during the period under review, the average yield for the whole country being only about one-third of that for 1926. Black rust (*Puccinia graminis*) was less destructive. The following parasitic fungi are stated to be new to the country: *Pseudoperonospora humuli* on wild hops [*R.A.M.*, vii, pp. 398, 399]; *Myxosporium malicorticis* [*Discosporium pyri*: ibid., v, p. 747] on apple; and *Leptosphaeria herpotrichoides* on rye.

BISBY (G. R.) & CONNERS (I. L.). **Plant diseases new to Manitoba.**—*Scient. Agric.*, viii, 7, pp. 456–458, 1928.

In this article notes are given on a number of parasitic fungi, most of which are stated to be new records for Manitoba. Among these may be mentioned *Phytophthora infestans* on potato, *Plasmo-*

para viticola on grapes, *Uromyces fallens* on red clover, *Urocystis cepulae* on onion, *Sphaerotheca mors-uvae* on currants, *Colletotrichum pisi* on peas, *Basisporium gallarum* [*Nigrospora sphaerica*] and *Puccinia sorghi* [*P. maydis*] on maize, *Peronospora effusa* on spinach, and *Plasmopara halstedii* on cultivated sunflowers.

[ROBERTSON (H. F.).] **Mycology.**—*Rept. on the Operations of the Dept. of Agric., Burma, for the year ended 30th June 1927*, pp. 11–12, 1927. [Received June, 1928.]

In addition to items already noticed from other sources, the following are of interest. The two fungi associated with internal boll disease of cotton [*Nematospora gossypii* and *N. coryli*: *R.A.M.*, vi, p. 290] have been found on four other species of wild and cultivated plants. The part played by the red cotton bug [*Dysdercus cingulatus*] remains obscure, but there is little doubt that this insect is a carrier of the disease. In connexion with these investigations, an internal bacterial decay of Wagale cotton bolls was frequently encountered, its incidence varying from 7·5 to 17 per cent. of the bolls examined. It has also been found to the extent of 24 per cent. on Cambodia cotton. A root disease of Cambodia cotton is under investigation in the Lower Chindwin district.

Sugar-cane mosaic was reported from three new localities. The efficiency of sett selection and roguing in the control of this disease has been demonstrated at Sahmaw, where infection was reduced in one case from 90 to 1 per cent. In general, the damage caused by the disease is slight, and there is some doubt whether the form of mosaic occurring in Burma is identical with that known elsewhere.

Jowar [sorghum] smut [*Sphacelotheca sorghi*] occurred in a severe form, affecting 60 per cent. of the crop in some places. The copper sulphate treatment gave complete control in the Sanpyaung type, but not in that of Kunpyaung on account of the close attachment of the glumes to the grain.

Attempts to isolate a specific organism from wilted gram [*Cicer arietinum*] plants gave negative results.

Good control of secondary leaf fall of rubber [*Phytophthora meadii*] was obtained on an estate of 70 acres by spraying with Bordeaux mixture [ibid., vi, p. 183].

SINGH (R. D.). **Annual Report of the Cerealist to Government, Punjab, Lyallpur, for the year ending 30th June, 1926.**—*Rept. on the Operations of the Dept. of Agric., Punjab, for the year ending 30th June 1926, Part II*, (I), 1–45, 1927. [Received June, 1928.]

This report contains, *inter alia*, the following items of phytopathological interest. None of 39 varieties of wheat imported from America (13), Russia (11), and Australia (15) on account of reputed resistance to bunt [*Tilletia tritici* and *T. levis*] and loose smut [*Ustilago tritici*] gave a satisfactory yield. Excellent control of loose smut was obtained by 4 to 6 hours' immersion of the seed-grain in water heated to 68° to 86° F., followed by ten minutes in water at 129°. The loss in germinative capacity from this treatment amounted to only 5 per cent.

Heavy damage to the gram [*Cicer arietinum*] crop in a number

of places in the Attock district has been caused during the last two years by blight (*Mycosphaerella pinodes*) [*R.A.M.*, vii, p. 1], which causes a brownish spotting of the shoots, stems, and pods and often kills the plants. Late varieties, e.g., Rajanpur, Alipur, Punjab No. 23, and Khanewal suffered severely in the Bariar experimental crop, while Punjab No. 7, Bhakkar, Isakhel, and Mianwali were resistant. Further experiments in varietal selection are in progress. In the meanwhile, control measures should include the use of healthy seed from uninfected localities, burning of diseased material, and a three to four years' crop rotation.

Reed (G. M.). **Plant pathology.**—*Seventeenth Ann. Rept. Brooklyn Bot. Gard., 1927* (*Brooklyn Bot. Gard. Record*, xvii, 2), pp. 43–49, 1928.

In continuation of his previous experiments on varietal reaction to loose and covered smut of oats (*Ustilago avenae* and *U. levis*), the author found that, in general, the behaviour of the F_3 families corresponds with the data obtained in the second generation [*R.A.M.*, vi, p. 535], indicating that resistance to smut is dominant and that the segregation of resistant and susceptible individuals occurs on the basis of a typical three to one ratio. Two distinct strains of *U. avenae* are now recognized as occurring, respectively, on the Fulghum and Red Rustproof varieties of oats.

Previous investigations by Dr. J. A. Faris having demonstrated the existence of biological strains of covered smut of barley (*U. hordei*) [ibid., iv, p. 214], additional studies were made with the races originally differentiated, and also with new material from other localities. It is evident that certain strains of the fungus, e.g., those found on Hannchen and Nepal barley, are strictly specialized, while others are apparently capable of attacking a wider range of varieties.

In further studies on the inheritance of the resistance of certain crosses between sorghum varieties to covered kernel smut (*Sphacelotheca sorghi*) [ibid., vi, pp. 535, 664], the F_2 generation plants of the cross between resistant Feterita and susceptible Sumac Sorgo showed 48·1 per cent. infection. In another family of the same cross 34·6 per cent. of the plants were infected. In one progeny of a cross between the highly susceptible Dawn Kafir and Feterita 41·6 per cent. of the plants were smutted, in another 50·2, and in a third 46·3 per cent. The susceptible parents in these crosses gave 49·2 and 65·1 per cent. infection, respectively. The number of infected plants (6·2 per cent.) in the F_2 generation of a cross between Standard White Milo and Blackhull Kafir was considerably lower than in the previous year.

These results suggest that in the crosses between Feterita and Sumac Sorgo, and between Feterita and Dawn Kafir, susceptibility is dominant in the second generation. On the other hand, in the cross between Standard White Milo and Blackhull Kafir resistance is dominant. It appears quite clear, therefore, that in some crosses resistance is dominant, while in others it is recessive.

Further experiments were conducted in connexion with the head smut of maize and sorghum (*Sorosporium reilianum*) [ibid., vi, p. 548]. It was shown that a high proportion of infection (fre-

quently reaching 100 per cent.) could be secured by the inoculation of dry seed with a freshly prepared spore-soil mixture, and heavy infection also occurred on seedlings with plumules of 2 to 2·5 cm. in length inoculated with older spore-soil mixtures. In a series of tests to determine the effect of temperature on the incidence of head smut, relatively high infections occurred at 20° and 25°, with a decline at 30° and 35°, though even at the latter temperature a considerable number of plants became smutted.

TEHON (L. R.). **Epidemic diseases of grain crops in Illinois, 1922–1926. The measurement of their prevalence and destructiveness and an interpretation of weather relations based on Wheat leaf rust data.**—*Illinois Dept. Registr. and Educ. Div. of Nat. Hist. Survey, Bull.* xvii, Art. 1, pp. 1–96, 10 figs., 75 maps, 18 graphs, 1927. [Received 1928.]

This report, stated to be the first detailed and extensive study yet made of the occurrence and distribution of diseases of field crops in Illinois [cf. *R.A.M.*, iv, p. 334], gives an exhaustive analysis of the annual incidence of cereal diseases in that State from 1922 to 1926 and a full explanation of the statistical methods adopted, by which prevalence (the proportion of diseased to all stems in a given area) and destructiveness (the average amount of affected tissue per unit) are expressed numerically with reference to a standard index figure of 100 for complete prevalence or destructiveness. As the plants grow very closely together, to avoid confusion, the stem was taken as the unit in estimating the amount of disease present.

Field notes were taken on the areas involved, symptoms, source of infection, control methods, local conditions, and phenology; and the corresponding samples were examined in the laboratory. The records, assorted according to diseases, were placed in folders and arranged by counties and in order of the dates of field observation. The data presented in each folder, expressed numerically, were then tabulated to show the percentage prevalence and severity of the disease in each county and in the whole area affected, these figures being subsequently converted [by a method which is described] into terms representative of the whole State.

The percentage proportion of diseased stems was estimated from sample bundles of different numbers of stems collected at various points, great care being exercised duly to adjust or 'weight down' the final average percentage in proportion to the number of stems in the different bundles. The average amount of infection in each diseased unit was estimated by comparing a number of average diseased samples with a prearranged series of standard values of infection; the figure so obtained was then adjusted to represent the equivalent amount of infection that would be present on each unit in the district concerned, supposing every unit to be affected. For this purpose the formula $\frac{D \times P}{N}$ was used, in which D is the average amount or percentage of infection per diseased stem, P the number or percentage of diseased stems, and N the total number of stems or 100. In a given example, referring to

P. triticina, from an area of 20 acres, the figures obtained were $\frac{20 \cdot 8 \times 25 \cdot 8}{100}$, showing an infection equivalent to 5·36 per cent. of the leaf area of every stem in the field.

The crops dealt with comprise wheat, oats, barley, rye, and maize, and the diseases rusts [*Puccinia* spp.], smuts [*Ustilago* spp.], scab [*Gibberella saubinetii*], bunt and speckled leaf spot of wheat [*Tilletia levis* and *Septoria tritici*], halo blight of oats [*Pseudomonas* (*Bacterium*) *coronafaciens*], and stripe of barley [*Helminthosporium gramineum*].

The wide differences in the index figures for the annual prevalence of the different cereal rusts, and the trend of prevalence from year to year, are considered to indicate that there are particular weather conditions conducive to the maximum prevalence of each rust. In no year was the prevalence of any disease uniformly heavy or light on all the crops affected. The nearest approach to such a condition was in 1925, when the total prevalence of disease in each crop was less than in 1924. Beginning with a wide range of total prevalence in 1922, a downward trend was observable for rye, maize, and oats, and an upward trend for barley and wheat, in 1923; in 1924 the trend was downward for wheat and rye, but upward for the other crops; in 1925 the prevalence of all the diseases declined; while in 1926 the trend was downward for maize and rye, but upward to relatively high points for wheat, oats, and barley. The index figures for the total average prevalence of all diseases throughout the period are: wheat, 142·85; oats, 141·2; barley, 107·47; rye, 62·22; maize, 34·44.

The paper terminates with a long section, based on the wheat rust data obtained, on the relations between cereal diseases and weather.

FAWCETT (G. L.). **Departamento de Botánica y Patología Vegetal.** [Department of Botany and Plant Pathology.]—*Rev. Indus. y Agric. Tucumán*, xviii, 9–10, pp. 172–174, 1928.

The following references, other than those already noticed, are of interest in this report. Mosaic continues to be the sole sugar-cane disease of economic importance in Tucumán [*R.A.M.*, iv, p. 378]. The results of a test with P.O.J. 2725 cane indicate that mosaic is not seriously increased by the use of diseased cane for 'seed', since only a few plants grown from setts from mosaic-infected stools showed signs of infection by the end of the second year.

No positive results have yet been obtained in the search for the insect vectors of the virus diseases of tobacco and tomato, which are of a very serious nature.

STANER (P.). **Belgian Congo: fungi and insects new to the Colony.**—*Internat. Rev. of Agric.*, N.S., xix, 4, p. 399, 1928.

The following fungi new to the Belgian Congo are recorded: *Ustulina zonata* attacking Hevea rubber on the Forminière plantations of Lake Leopold II; *Corticium* sp. (with spores measuring 8 by 3 μ) forming pearl-grey patches with white rims on a *Hevea* tree at Eala; a species of Thelephoraceae living in symbiosis with a scale insect on coffee roots; *Cercosporella gossypii* causing the

development of whitish patches on cotton leaves; *Marssonia* [*Marssonina*] sp. causing a brown discoloration of the veins of cotton leaves; and *Melanostroma* sp. forming its fructifications on cotton leaves previously discoloured by its mycelium (all the cotton diseases at Ubangi).

DUCLOS (H.). **Contribution à l'étude des parasites des plantes à Madagascar.** [A contribution to the study of plant parasites in Madagascar.]—*Rev. Path. Vég. et Ent. Agric.*, xv, 3, pp. 67–73, 1928.

In this account of plant diseases observed at the station of Ivoloina, Madagascar, and in the northern regions of the island, the author states that in the former place *Hemileia vastatrix* was noted on the older leaves of coffee at the end of the dry season, but disappeared without causing any injury on the return of the rainy weather.

The most serious disease of cacao in Madagascar is root rot. In one instance, the disease began as isolated attacks in the middle of a plantation, and the dead wood not being destroyed, the rot spread until, a few years later, it had destroyed 50 hectares of trees. The disease is stated to attack the shade trees (*Albizzia lebbek*) before spreading to the cacao. The fungus [unspecified] is also found on coffee.

Lasiodiplodia [*Botryodiplodia*] *theobromae* is present on cacao throughout the island, the pods being attacked in all stages of their growth. Moderately good control was obtained by repeated treatments with 2·5 per cent. Bordeaux mixture, the adhesiveness of which was increased by the addition of the liquor obtained from steeping cut leaves of *Agave rigida* in water for forty-eight hours and then evaporating to a treacly consistency.

A canker, sometimes as large as a person's head, was observed on *Afzelia bijuga*, but no organism was seen on it.

Gummosis, mostly of plants living outside their natural habitat, such as various species of *Eucalyptus* and *Mimosa*, was also observed.

GOLDSWORTHY (M. C.). **The production of agglutinins by phytopathogenic bacteria.**—*Phytopath.*, xviii, 3, pp. 277–288, 1928.

After a discussion of the literature on the production of anti-sera against phytopathogenic bacteria [*R.A.M.*, iv, p. 469], the writer describes and tabulates the results of his experiments with *Pseudomonas cerasus* vars. 28 and 29, causing bacterial gummosis of cherry [ibid., iv, p. 488] and *Bacterium maculicolum*, the agent of cauliflower spot [ibid., vii, p. 565].

The production of satisfactory agglutinating anti-sera against phytopathogenic bacteria appears to be as simple as against animal parasitic bacteria. The phytopathogenic forms differ greatly in their capacity to produce antigens in the sera of rabbits, this power being apparently correlated with the elaboration of toxic products. It would seem that, in the organisms tested, the production of suitable antisera can only be accomplished by the infection of living organisms in fairly large doses. Extremely potent antisera can be obtained against the species yielding toxic products, but titres

against the ordinary forms cannot be expected to exceed 1 in 10,000. The best results were secured by the intravenous injection of living antigens. The organisms used proved very specific, no cross-agglutination taking place.

PATEL (M. K.). **A study of pathogenic and non-pathogenic strains of Pseudomonas tumefaciens Sm. & Town.**—*Phytopath.*, xviii, 4, pp. 331–343, 1928.

In this paper the author describes the methods, and discusses and tabulates the results of his studies on the longevity, distribution, and overwintering of *Pseudomonas* [*Bacterium*] *tumefaciens* in Iowa, a preliminary account of which has already been noticed [*R.A.M.*, vii, p. 430].

LAKHOVSKY (G.). **L'action sur les êtres vivants des circuits oscillants captant les ondes cosmiques.** [The effect on living beings of oscillating circuits intercepting cosmic waves.]—*Comptes rendus Acad. des Sciences*, clxxxvi, 15, pp. 1019–1021, 2 figs., 1928.

The author states that a *Pelargonium* seedling inoculated in 1925 with *Bacterium tumefaciens* and exhibiting a tumour in the initial stage, entirely recovered in less than two months under the action of an oscillating circuit constituted by a copper wire spirally wound around the stem at the level of the lesion and isolated by an ebonite support. At first the tumour rapidly grew without visibly interfering with the vitality of the plant, but it finally died off and was shed. All the control plants similarly inoculated perished. This result was further confirmed in a similar experiment made at the École d'Agriculture in Montpellier in the spring of 1927.

KAUFFMANN (F.). **Über die Veränderlichkeit von Tumefaciens-bacillen.** [On the variability of *tumefaciens* bacilli.]—*Zeitschr. für Krebsforsch.*, xxvi, 4, pp. 330–332, 3 figs., 1928.

The strain of *Bacterium tumefaciens* cultured in Germany by Blumenthal, Reichert, and the author [*R.A.M.*, vii, p. 366] has hitherto been uniformly non-motile, but recently motile bacteria have been detected in fresh bouillon cultures of the organism (including the P.M. strain). One to five (occasionally more) peritrichiate flagella were observed. Another instance of variability in this organism is the occurrence of rough colony forms [ibid., vii, p. 192] differing in serological characters from the smooth ones. The rough colonies appeared after continuous sub-culturing from the smooth ones. By the addition of faecal extracts to the cultures it was possible to obtain a bacteriophagous lysin which was effective against both the smooth and rough forms of *Bact. tumefaciens*.

BUNTING (R. H.). **Cocoa diseases prescribed by the Plants (Injurious Pests) Ordinance.**—*Gold Coast Dept. of Agric. Bull.* 11, 39 pp., 15 col. pl., 5 diags., 1928. [Twi translation.]

Popular descriptions, illustrated by excellent coloured plates, are given of the following important fungous diseases of cacao in the

Gold Coast: mealy pod [*Trachysphaera fructigena*], black pod and stem canker [*Phytophthora faberi*], collar crack [*Armillaria mellea*], white root [*Fomes lignosus*], brown root [*F. lamaoensis*], collar rot [*Ustulina zonata*], white thread [*Marasmius scandens*], and horsehair blight [*M.* sp.]. Directions are given for the control of these diseases, all of which are included in the category of injurious pests as defined by the Plants (Injurious Pests) Ordinance [1923: which provides for the declaration of any disease or pest of plants to be an injurious pest and for treatment of such diseases in any prescribed manner: *R.A.M.*, vi, p. 704].

PETCH (T.). **Brown thread blight.**—*Trans. Brit. Mycol. Soc.*, xiii, 1–2, pp. 142–143, 1928.

The author states that the examination of further material supplied to him of the brown thread blight of cacao and kola (*Cola acuminata*) from West Africa, which he described in a previous paper [*R.A.M.*, iv, p. 66], showed fructifications of the fungus. These proved to be, as surmised, a *Marasmius*, which he names *M. byssicola*. An English description of the fructifications is given, and it is stated that, in the specimen examined, the hymenium was pale ochraceous, though they apparently become red-brown when old.

BAILEY (D. L.) & GREANEY (F. J.). **Dusting with sulphur for the control of leaf and stem rust of Wheat in Manitoba.**—*Scient. Agric.*, viii, 7, pp. 409–432, 10 figs., 8 charts, 1928.

Details are given of a comprehensive series of experiments conducted in Manitoba during 1927, a year of severe rust, on the control of leaf and stem rust of wheat [*Puccinia triticina* and *P. graminis*] by applications of kolodust [*R.A.M.*, vii, p. 368]. The quantities tested were 15, 30, and 45 lb. dust at each application and the frequencies were once every two weeks and once, twice, and three times a week. Briefly summarized, the results [which are tabulated, expressed graphically, and fully discussed] are as follows.

With a hand duster of the blower-gun type, the best control was obtained by three applications a week of 45 lb. per acre from 18th July until 9th September. The plot so dusted showed 4 per cent. stem rust and 15 per cent. leaf rust, as compared with 87 and 62 per cent. infection, respectively, in the control. With any given quantity of dust, the control improved as the applications were made more frequently. As the cost of so many applications would be prohibitive locally, the use of 30 lb. twice, or 45 lb. once, a week is recommended in a year when rust is severe, as these applications gave fair control.

The best control was also given when dusting was begun at an early date. Weekly treatment at 15 lb. per acre when begun on 18th July gave approximately the same control as three similar applications each week when started only one week later, while applications of 45 lb. per acre twice weekly gave no significant result at all when delayed until 8th August. In general, also, treatment should be continued until the crop matures.

Mixed with one per cent. of potassium permanganate [cf. ibid.,

vii, p. 254] the kolodust gave very slightly better results than when used alone.

With a horse-drawn power duster the best results were obtained from weekly applications (18th July until 8th September) of 30 lb. per acre; these gave a net increase in crop value of $15·28 per acre. A similar test was carried out privately by a farmer with a modified horse-drawn Niagara 'aero-duster' (Niagara Sprayer Co., Middleport, New York), mounted on a high platform and equipped with a 5 h.p. New Way engine; the dust was discharged to a range of 30 to 40 ft. through a 5 in. blower pipe which oscillated from side to side. Two treatments at 25 lb. per acre were given each week from 21st July to 13th August. The average infection of stem rust in the treated area was 35 per cent. as compared with 85 per cent. in the control; the yield was increased by 12 bushels per acre, and the grade improved from no. 5 to 3 Northern, these figures representing a net increase in crop value of $11·87 per acre, a figure which would have been higher still had the crop ripened earlier or a final dusting been given.

In aeroplane dusting tests, the machine [a Huff-Daland dusting plane, some details of which are given] flying at about 100 m.p.h. 15 to 25 ft. above the crop, the best results were obtained on 190 acres at Graysville, where the conditions were most suitable. Here the rust infection in two fields, 75 and 30 acres in extent, given four applications at weekly intervals of 15 lb. per acre, was 35 and 45 per cent., respectively, as compared with 75 per cent. infection in the control. The yields were, respectively, 22 and 28 bushels per acre of nos. 2 and 1 Northern wheat, as compared with 13 bushels per acre of no. 5 Northern in the control. The figures for the second field represent an increased crop value of $42 per acre; the 60 lb. of dust used did not cost more than $5·0 per acre.

In the two other districts, Morden and Portage, in which aeroplane dusting was tested, the results were unsatisfactory for various reasons, though in almost every case the dusted fields gave better yields than the general average of the neighbourhood. All the dusting was done in the evening; with a 10 m.p.h. wind the results were very unsatisfactory, and in some cases heavy dashing rains between the applications decreased their efficacy. The lateness of the crop also led to the cessation of dusting too soon, and the quantity applied was probably too small. On the whole, however, the work gave a convincing demonstration that aeroplane dusting is practicable and likely to prove very useful where there are large continuous areas under wheat.

The results obtained by the various methods of dusting tested are considered to be distinctly encouraging, but at least three seasons will be necessary to determine the full value of the methods described.

MENCACCI (M.). **Esperienze sopra alcuni trattamenti ai cereali.** [Experiments upon certain cereal treatments.]—*Boll. R. Staz. Pat. Veg.*, N.S., viii, 1, pp. 96–110, 1928.

During the spring of 1927 further experiments in the control of wheat rusts [*Puccinia* spp.] by dusting with cupric sulphur [*R.A.M.*,

vii, p. 147] were conducted at Aguzzano, Italy. The dust used on each plot consisted of 450 gm. commercial cupric sulphur ['solfo ramato': ibid., i, p. 66] mixed with 3 per cent. of [dehydrated] copper sulphate, and to each plot, except one, with its corresponding control, a superphosphate and cyanamide fertilizer was applied.

The best result was obtained with wheat of the Gentil Rosso 48 variety, although in 1926 this variety was heavily infected with *P. triticina* and *P. graminis*. The plot (from 300 gm. of seed) was dusted at intervals of 15 days from 9th April until 29th May, and again on 8th June, and gave a yield of 5·78 kg. of specific weight [? weight per unit volume] 75·4, as compared with 3·64 kg. of specific weight 71·4 in the untreated control.

A similar plot of the variety Gentil Rosso 58 was dusted on 5th and 24th April, 14th and 29th May, and 8th June; the yield was 5·07 kg., of specific weight 75·2, as compared with 4·37 kg., of specific weight 72 in the untreated control. Another plot of the same variety of wheat was dusted on 9th and 25th April, 14th May, and 8th June, but received no fertilizer. The yield (from 400 gm. of seed) was 4·23 kg., of specific weight 73·9; that of the control plot, which also received no fertilizer, was 3·74 kg., of specific weight 72·8.

Rieti wheat (300 gm. of seed) was dusted on 7th April as a preventive measure, and then on 24th April, 14th May, and 8th June, when the weather favoured infection; the yield obtained was 6·18 kg., of specific weight 75, as compared with 5·9 kg., of specific weight 73·5 in the untreated control.

The author considers that the best results are obtained when dusting is applied during the ripening of the wheat, the reduction of infection during this stage being marked in all the sulphured plots. In normal years three applications should give good results. Attention is drawn to the fact that these results were obtained from plots in close proximity to untreated controls and infected experimental beds.

NEWTON M[ARGARET], JOHNSON (T.), & BROWN (A. M.). **Physiologic forms of Wheat stem rust in Canada.**—Abs. in *Scient. Agric.*, viii, 7, p. 461, 1928.

Greenhouse experiments at the Dominion Rust Research Laboratory, Winnipeg, showed that twenty-four physiologic forms of wheat stem rust [*Puccinia graminis*: *R.A.M.*, vii, p. 298] are present in Canada, five of which differ from those reported in the United States. The evidence also suggests a possible relationship between the varieties of wheat grown and the distribution of the physiologic forms of the rust.

Thirty-three separate cultures of the aecidial stage of the rust grown on barberry plants [*Berberis vulgaris*], all but one of which had been artificially inoculated (mostly with teleutosori from *Hordeum jubatum*), were transferred to wheat in the greenhouse. In fourteen of the cultures greyish-brown pustules appeared, which, as previously reported [ibid., vii, p. 235], remained constant in colour and produced only greyish-brown uredosori.

HARRINGTON (J. B.). **The effect of harvesting rusted Wheat early.** —*Scient. Agric.*, viii, 8, pp. 481–491, 2 figs., 1 diag., 1 graph, 1928.

Under heavy stem rust [*Puccinia graminis*] conditions at Saskatoon (Canada) in 1927, representative samples were cut from six varieties of wheat, viz., Red Fife, Kitchener, Renfrew, Early Red Fife, Marquis (all susceptible), and Pelissier (resistant), at intervals of two or three days, beginning on 24th August and ending at maturity (5th September).

The average kernel weight showed a significant increase from the beginning of the test until two days before maturity. A definite increase in kernel plumpness was registered during the week before maturity. Wheat cut a week before ripening showed a larger proportion of very shrunken kernels and fewer plump ones than that cut two days prior to maturity. A slight tendency towards improvement in quality during the week before maturity was also observed.

The popular opinion in favour of harvesting rusted wheat a week or more before maturity is not founded on facts. These experiments show conclusively that rusted wheat should be harvested at the normal time, i. e., two or three days before complete maturity [*R.A.M.*, iii, p. 637].

STAKMAN (E. C.) & LAMBERT (E. B.). **The relation of temperature during the growing season in the spring Wheat area of the United States to the occurrence of stem rust epidemics.**—*Phytopath.*, xviii, 4, pp. 369–374, 3 graphs, 1928.

The results of a study of the correlation between meteorological conditions and the occurrence of stem rust (*Puccinia graminis*) epidemics in the hard red spring wheat area of the United States during the past 22 years are briefly discussed [*R.A.M.*, vii, p. 432], details being reserved for future publication. A general tendency is shown for the development of destructive epidemics in warm growing seasons (average temperature above 64° F.) while cool ones (average temperature below 61°) are comparatively free from rust. In 1910, a year of relatively high average temperature (over 63·5°), very little rust developed owing to the protracted drought. The epidemic of 1916, the most destructive on record, occurred during a season of moderate temperature (62·5°) in the wheat-growing area as a whole, but the average temperature in July was higher in Minnesota and North and South Dakota than at any other time during the period under review.

JOHNSON (T.) & NEWTON (M[ARGARET]). **The occurrence of yellow stripe rust in Western Canada.**—Abs. in *Scient. Agric.*, viii, 7, p. 464, 1928.

Since its discovery in Alberta in 1918, *Puccinia glumarum* has occurred annually in certain parts of the Province on *Hordeum jubatum* but has only once been found on barley. It was observed on wheat in 1926–7. Other hosts naturally infected are *Agropyron smithii* and *A. tenerum*. Stripe rust is found in scattered localities from Edmonton to the international boundary and also in south-western Saskatchewan.

Greenhouse cultures of the rust from wheat and *H. jubatum* were both proved to belong to *P. glumarum* f. *tritici*, showing that under favourable conditions the rust on *H. jubatum* may also affect wheat. Germination of uredospores produced in the greenhouse was low and irregular under all the conditions tried; the best (about 8 per cent.) was at 10° and 15° C.

ALLEN (RUTH F.). **A cytological study of Puccinia glumarum on Bromus marginatus and Triticum vulgare.**—*Journ. Agric. Res.*, xxxvi, 6, pp. 487–513, 12 pl., 1928.

After a brief review of previous cytological studies of stripe rust (*Puccinia glumarum*) of wheat, the author gives a detailed description of her own investigations of the cytology of the fungus on *Bromus marginatus* and four varieties of *Triticum vulgare* of various origins.

On germinating, the germ-tube from the uredospore grows to a stoma, which it enters without forming a definite appressorium: the contents of the tube are somewhat denser at the growing tip, but the tube swells little, if at all, on reaching the stoma, and usually no septum is formed to separate an appressorial cell. In the experiments, the uredospores germinated overnight, but the inoculated leaves did not 'fleck' until the eighth, ninth, or even tenth day, varying somewhat with the host and the time of year. On the second day from inoculation, the fungus consisted of a multinucleate substomatal vesicle with one to three slender infecting hyphae, each of which had formed a small haustorium. During the next two days, the only development noted was a swelling of the vesicle and initial hyphae to several times their original dimensions, the slowness of this process being explained by the small number and size of the haustoria which draw food from the host.

The next stage of the infection is marked by the protrusion from the expanded substomatal vesicle of a hypha which advances in the intercellular spaces of the leaf tissue; it is pointed out that this hypha is from the outset full-sized, multinucleate and continuous, like the hyphae that are formed subsequently. The young hypha develops haustoria in abundance. The mother cell of the haustorium is a short, broad cell containing from two to six nuclei; but apparently all but one of these nuclei degenerate before the haustorium is formed. The latter is uninucleate, simple or branched, and has a maximum length of 35 or 40 μ. The host nucleus is usually found in contact with the haustorium. Normally, on ageing, the haustorium becomes drained of its contents, but some haustoria of older infections on all the hosts studied were seen to undergo degeneration, and their necks were sometimes encrusted with a granular, dark-stained substance.

The progress of the infection is ensured by the development of vigorous non-septate hyphae which grow along the leaf through the substomatal passageways, while branches from these runners permeate the smaller air spaces of the tissues. The transverse spread of the fungus is limited by leaf veins, whose reinforced tissue is impenetrable to it. About the tenth day from inoculation, septation begins in the older parts of the mycelium, and there-

after the septate area spreads, while keeping a short distance behind the advancing runners. The first septa cut a hypha into long cells, in which the hitherto irregularly dispersed nuclei become arranged in pairs; these long cells are then divided into binucleate cells by the formation of further septa. During septation, branches from the runners and from the feeding hyphae grow to the upper epidermis of the leaf, and form there subepidermal binucleate spore-bearing cells which may give rise to several binucleate spores in succession. A few of the last uredospores formed on a maturing host plant may be multinucleate. During the stage of spore formation, the host tissues underlying the uredosori become impoverished, and in one of the hosts studied, two types of intracellular bodies were observed in the cells.

The uredosori are small and are usually bounded by a zone of paraphyses; this limitation in their size is compensated by their formation in large numbers in succession along the lines of advance of the runner; chains of 100 or more uredosori were frequently observed.

In the glumes, much of whose tissue is impenetrable to the fungus, the latter usually enters from the inner surface which is lined with mesophyll tissue, and forms uredosori on the same surface.

Teleutosori may be formed as the host matures. The development of the teleutospore is the same as in other wheat rusts: the spore primordium divides, forming a stalk cell, and then divides again to form a two-celled spore. Each cell contains two nuclei, which fuse as the spore matures.

There was no positive evidence of the existence of any compensatory process in the uredo stage which would replace the aecidial stage.

SCOTT (I. T.). **Varietal resistance and susceptibility to Wheat scab.**—*Missouri Agric. Exper. Stat. Res. Bull.* 111, 14 pp., 1927. [Received June, 1928.]

This bulletin summarizes the results of the author's investigations conducted during the years 1921–2 and 1924–5 of the varietal resistance and susceptibility of wheat to scab (*Gibberella saubinetii*), most of which have already been noticed from other sources [*R.A.M.*, vi, p. 468]. Unfavourable weather conditions at sowing time are stated to have prevented the tests from being prosecuted in 1926 and 1927.

The outstanding feature of the inoculation experiments was the low percentage of infection obtained in all the four years even on the most susceptible varieties, this being correlated with the abnormal weather conditions which prevailed during the flowering and filling period of the wheats; natural scab infection of the crops was also very slight during these four years in the neighbourhood. An epidemic of scab broke out, however, in 1927, when the months of May and June were marked by excessive precipitation with a temperature 1·1° F. below normal in May, and 3·3° below normal in June. This emphasizes the relationship of wheat scab to weather conditions, the indications being that moderately high temperatures and heavy rainfall, accompanied by overcast weather at the time of infection, result in epidemics of the disease.

Of all the varieties and strains of wheat tested, the following showed the lowest infection with scab and the greatest adaptability to the conditions prevailing in Missouri: Fulcaster W 18, Michigan Wonder 207, Red May W 203, Red May W 210, Red May W 214, and Red Cross W 206. It is pointed out, however, that fairly considerable variations in relative resistance to *G. saubinetii* were noted in selections within certain established varieties.

RUSSELL (R. C.). **The reaction of Wheat varieties to inoculations with Ophiobolus graminis Sacc.**—Abs. in *Scient. Agric.*, viii, 7, p. 459, 1928.

Approximately 150 seedlings of each of 75 varieties of wheat were inoculated in the greenhouse at Saskatoon, Canada, with a pure culture of *Ophiobolus graminis*. After five weeks the inoculated plants were stunted, their height being only about 40 per cent. that of the controls, and some 60 per cent. were dead. Slight but fairly consistent differences in varietal susceptibility were observed, and good correlation coefficients between the percentage deaths of the different varieties in the different tests were obtained. The resistance shown even by the strongest varieties, however, was insufficient to justify their use in infected fields.

SIMMONDS (P. M.) & SCOTT (G. A.). **Seed treatments for the control of seedling blight in cereals.**—*Scient. Agric.*, viii, 8, pp. 502–511, 1 pl., 1928.

Extensive greenhouse tests [the technique of which is fully described and the results tabulated] were carried out at the Division of Botany (Experimental Farms Branch), Ottawa, to determine the relative merits of certain cereal seed treatments (five liquid and nine dusts) against natural soil infection and artificial inoculation with *Fusarium culmorum* and *Helminthosporium sativum* [*R.A.M.*, vii, p. 313]. Marquis wheat, Hannchen barley, and Banner oats were used in the experiments with *F. culmorum*, and the two first-named also in those with *H. sativum*. Semesan, germisan, and uspulun (0·3 per cent. solutions), and Dupont No. 12 dust (used in sufficient quantity to coat the seeds) exercised a distinct protective action against infection from inoculation with the fungi in question as well as from the soil, while formalin solution and sulphur dust were very unsatisfactory. Variable results were obtained with tillantin solution [uspulun-universal] and segetan dust as well as with urania, copper carbonate, and some of the Dupont dusts.

HADFIELD (J. W.). **Certification of seed Wheat. Inauguration of system in Canterbury.**—*New Zealand Journ. of Agric.*, xxxvi, 4, pp. 223–226, 1928.

As most of the serious diseases of wheat in New Zealand are seed-borne (though some are soil-borne in addition), a scheme of seed certification has recently been introduced into Canterbury with the object of rendering available reasonably pure and disease-free lines of seed. The production of such seed is to be stimulated by the offer of a bonus.

During 1928, which was the first season, inspections were limited

to the crops grown by the Canterbury Agricultural College, Lincoln, and by farmers from seed produced by the College the previous season.

Growers of crops which passed the field inspection were required to guarantee that their threshing mills would be thoroughly cleaned, and as a further precaution the first three, and sometimes the last three, sacks from the mill were rejected. The grain was then sampled and graded.

RODENHISER (H. A.). **Experiments on the control of Barley stripe.**—*Phytopath.*, xviii, 3, pp. 295–300, 1928.

Four liquid fungicides, namely, 0·25 per cent. uspulun, 0·25 per cent. germisan, 0·3 per cent. semesan, and 1 in 320 formaldehyde, used at different temperatures (room and 45° C.) and for varying periods of immersion from half-an-hour to three hours, were tested for their efficacy in the control of *Helminthosporium gramineum* [*R.A.M.*, vi, p. 475]. Uspulun and semesan on barley gave the best results when the seed was immersed for one hour at room temperature, while uspulun, germisan, and semesan were all about equally effective when used at 45° for half-an-hour. Treatment with the organic mercury compounds resulted in somewhat increased yields, though hot germisan caused a delay in heading. Hot formaldehyde reduced the yields in 1925 and also retarded heading. Of the ten dusts further employed in the author's trials, at the rate of 4 oz. per bushel of seed, K–I–A and K–I–B (Du Pont de Nemours, Wilmington, Delaware) were completely effective, and Du Pont No. 12, S.A.F. No. 225, and wa-wa nearly so. Coppercarb and kolodust were unsatisfactory, and Bayer, semesan, and höchst [tillantin] only moderately efficient.

HOWITT (J. E.) & STONE (R. E.). **Results of experiments on the control of Barley stripe.**—Abs. in *Scient. Agric.*, viii, 7, p. 459, 1928.

In experiments on the control of barley stripe [*Helminthosporium gramineum*: see last abstract] conducted at the Ontario Agricultural College, with the susceptible hooded variety Success, the following seed treatments were applied: soaking for 2 hours at 22° C. in 0·25 per cent. semesan and 0·25 per cent. uspulun, and in the same solutions for 1 hour at 45°, dusting at the rate of 3 oz. per bushel with semesan, uspulun [tillantin R.], Du Pont No. 12, Bayer copper carbonate, and vitrioline. Formalin sprinkle 1 in 240 and dry formalin spray 1–1 were also used.

The formalin sprinkle prevented germination, but all the other treatments reduced infection and increased the yield, while Du Pont dust No. 12 and the 0·25 per cent. solutions of uspulun and semesan used at 45° for one hour gave complete control.

HAYES (H. K.), GRIFFEE (F.), STEVENSON (F. J.). & LUNDEN (A. P.). **Correlated studies in Oats of the inheritance of reaction to stem rust and smuts and of other differential characters.**—*Journ. Agric. Res.*, xxxvi, 5, pp. 437–457, 1928.

A detailed account is given of an investigation conducted from 1923 to 1927 for the purpose of studying the inheritance in oats of

reaction to black stem rust (*Puccinia graminis avenae*) and loose and covered smuts (*Ustilago avenae* and *U. levis*) in relation to other differential characters, namely: black or white glumes, the number of hairs on the rachilla bearing the second grain of the spikelet, and differences in the development of awns. The oats used in the experiments consisted of three apparently homozygous rust-resistant selections from previous crosses of White Russian with Victory or Minota, of which two were not named and bore the Nursery Series Nos. II–18–4 and II–18–37, respectively; the third has been named 'Anthony' and has been approved for distribution as the most promising stem rust resistant variety obtained so far. These selections produced white glumes, weak awns, few to no hairs on the rachilla of the second grain in the spikelet, and were susceptible to smut. The inheritance was studied in the F_1 to F_5 crosses of these selections with Black Mesdag which was susceptible to stem rust but immune from smut, and produced black glumes, strongly developed geniculate awns, and a large number of hairs on the rachilla of the second grain in the spikelet.

A detailed discussion of the results obtained showed that the characters black versus white glumes and rust resistance versus susceptibility gave a close approximation to the expectation of 3 : 1 segregations, with black dominant over white glumes, and resistance to rust dominant over susceptibility. There appeared to be no linkage, however, between inheritance of white or black glumes and of rust resistance or susceptibility. Segregation for number of hairs on the rachilla of the second spikelet agreed well with a 3 : 1 ratio of few to many hairs in the F_2 of the crosses of 'Anthony' and II–18–4 with Black Mesdag, while the cross of the latter with II–18–37 produced a greater proportion of segregates with few hairs than would be expected on the basis of the same ratio.

Segregation also occurred in regard to number and strength of awns, but the result of the study of the breeding behaviour of the F_3 plants, as compared with the classification of the F_2 plants, could not be explained on any simple genetic basis.

Reaction to smut infection was studied in the F_3 to F_5 progeny of each of the four groups: black glumed resistant to rust, ditto susceptible to rust, white glumed resistant to rust, and ditto susceptible to rust. Of a total of 378 lines thus tested, 86 were classed as susceptible to smut on the basis of the F_3 data, and they proved to be as susceptible as the susceptible parent. Forty-seven lines produced no smut in F_3 to F_5 and were classed as immune, and 36 lines proved to be highly resistant. The remainder of the lines produced a degree of smut infection which was less than the susceptible parent and more than the lines classed as resistant. The genetic factors for smut reaction could not be determined with accuracy in these studies. As a tentative explanation, the authors suggest that results of the same general nature could be obtained if there existed two factors I and R for immunity and resistance, respectively, both carried in the Black Mesdag parent, each allelomorphic to factors for susceptibility, and with the further hypothesis of I being epistatic to R.

The two classes for colour of glumes in the F_2, black and white, were compared for segregation of awns and for smut reaction by

the double X^2 test of goodness of fit. P values of 0·9113 and 0·2226 were obtained, thus indicating the absence of linkage between factors for colour of glumes and for awn development and smut reaction. There was a slight tendency in all three crosses for a loose linkage between the inheritance of hairs on the rachilla and colour of the glumes. No correlation between reaction to rust and awn development, or between reaction to rust and reaction to smut could be demonstrated by the X^2 test, since the values of P obtained were 0·2718 and 0·2697, thus indicating that a worse fit could be expected on the basis of random sampling once out of four times. The coefficient of contingency was used to determine any possible linkage between the number of hairs on the rachilla and awn development, the number of hairs and reaction to smut, and between the latter and the development of awns. All three coefficients were low and hardly significant in the light of their probable errors.

In terminating it is stated that several homozygous lines of oats have been obtained which are resistant to black stem rust, immune from smut, and which have weak awns and white glumes. These lines are being compared with Victory and Minota for yielding ability.

GORDON (W. L.). **Physiologic forms of Puccinia graminis avenae Erikss. & Henn.**—Abs. in *Scient. Agric.*, viii, 7, pp. 462–463, 1928.

After referring to the prevalence of five different physiologic forms of oat stem rust (*Puccinia graminis avenae*) [*R.A.M.*, vii, p. 309] in Canada, the author states that the heterogeneous or X reaction [ibid., ii, p. 159] was given by form 5 on two differential hosts when inoculations were made with single spore cultures. A collection from Paskwegin, Saskatchewan, in 1925, yielded a form which was able to infect heavily all differential hosts; it is considered to be new and has been named physiologic form 6. Greenhouse tests with more than 330 strains and varieties of oat seedlings from America and Europe showed that all were susceptible to form 6 and only one variety, from France, appeared to have any indication of resistance to form 4. A further test showed these forms to be equally virulent in the field.

SIMMONDS (P. M.). **A seedling blight disease of Oats caused by Fusarium culmorum.**—Abs. in *Scient. Agric.*, viii, 7, p. 463, 1928.

The author states that penetration of oat seedlings by *Fusarium culmorum* [*R.A.M.*, vii, p. 313] may take place through the mesocotyl or coleoptile; the fungus particularly invades the cortical tissues. Mycelium may collect between the coleoptile and the plumule, and tiller buds may be invaded as well as root primordia. Some evidence has also been obtained that entrance may occur through root hairs.

GARBOWSKI (L.). **Wrażliwość uprawianych w Polsce odmian Żyta na ridzę źdźbłową Puccinia graminis Pers. f. sp. secalis Er. et Henn.** [Susceptibility of the varieties of Rye cultivated in

Poland to stem rust, *Puccinia graminis* Pers. f. sp. *secalis* Erikss. & Henn.]—Reprinted from *Roczniki Nauk Rolniczych i Leśnych* [*Yearbook Agricult. and Silvicult. Sciences*], Poznań, xix, 46 pp., 4 pl., 1 graph, 1928. [French summary.]

The publication in 1923 of a notice in the *Gazeta Rolnicza* [*Agricultural Gazette*] of the discovery at the National Institute of Agricultural Science in Puławy of a variety of rye 'entirely immune' from stem rust (*Puccinia graminis* f. sp. *secalis*) aroused wide interest among cultivators in Poland, where rye is a very important crop and the disease annually causes heavy losses to the growers. The fact, however, that the Plant Breeding Section in Puławy, after testing the variety, expressed the opinion that its resistance was chiefly due to the early maturation of the plants, induced the author to undertake in 1924 a systematic study on the experimental fields of the Phytopathological Section in Bydgoszcz of the relative resistance to the rust of the varieties of rye most commonly grown in Poland, including the new variety. The results of the investigation [full details of which are given] up to the end of 1927 established that none of the varieties tested was entirely immune from the disease. Four varieties, however, namely, Puławskie wczesne and Puławskie ozime (two strains of the new variety), Mikulickie, and Grodkowickie, exhibited a high degree of resistance, manifested by a smaller number of sori on the leaves, lesser injury to the stems, smaller percentage of infected plants, and a lesser reduction in the weight of the grain harvested. The results also confirmed the opinion that the resistance of the new variety is mainly dependent on its early maturation.

Cross-inoculation experiments with the stem rust from rye were successful on barley but gave negative results on oats and wheat.

GUYOT (L.). **Parasitisme et toxicité (Ivraie enivrante et Seigle enivrant).** [Parasitism and toxicity (intoxicating Darnel and Rye).]—*La Nature*, 2781, pp. 263–264, 4 figs., 1928.

The consumption of flour made from rye parasitized by *Stromatinia* [*Sclerotinia*] *temulenta* [the reputed perfect stage of *Endoconidium temulentum*: *R.A.M.*, vii, p. 88], with which it is suggested that the endophytic fungus of darnel (*Lolium temulentum*) may be identical, produces the typical symptoms of inebriation. The admixture of darnel grains with wheat is stated to be now much less common than formerly, owing to improved methods of sifting, but the injurious effects of flour contaminated from this source have been known from the earliest times. The infected darnel seeds contain a toxic alkaloid, and those of rye parasitized by *S. temulenta* a glucoside causing intoxication or even death if introduced direct into the blood-stream. The association between *L. temulentum* and its fungus appears to be of a symbiotic character, whereas in rye the grain is definitely parasitized by *S. temulenta*.

STAKMAN (E. C.), CHRISTENSEN (J. J.), & BREWBAKER (H. E.). **Physiologic specialization in Puccinia sorghi.**—*Phytopath.*, xviii, 4, pp. 345–354, 2 figs., 1928.

The results of recent studies conducted at University Farm,

St. Paul, Minnesota, showed that rust (*Puccinia sorghi*) [*P. maydis*] may become a destructive pathogen on newly developed lines of maize. In 1923 and 1925 the fungus caused considerable damage to certain inbred lines of the Squaw Flint variety.

Of the 171 selfed lines investigated for their rust and smut (*Ustilago zeae*) reaction, some were extremely susceptible, others highly resistant, and a further number intermediate. All combinations of resistance and susceptibility to rust and smut appeared in the field.

Numerous collections of *P. maydis* were obtained from the Mississippi Valley, one from New Hampshire, and one from Winnipeg, Canada. Eight of the 45 selfed lines of maize inoculated with most of these collections were selected as differential hosts and used in a more extensive series of experiments. The results [which are tabulated and discussed] show that seven distinct physiological forms of *P. sorghi* can be recognized by their parasitic behaviour on these lines. Two of the forms originated in Minnesota, and one each in Texas, Oklahoma, Nebraska, and Iowa. Form 1 differed from the others in its relatively weak pathogenicity, its unusually pale uredospores, and its failure to produce teleutospores.

Attention is called to the fact brought out by these observations that a relatively innocuous parasite, such as *P. maydis*, may become very destructive to new varieties of the host plant produced by breeding.

STONE (R. E.). **Treatment of Millet seed to prevent smut.**—Abs. in *Scient. Agric.*, viii, 7, p. 462, 1928.

In experiments at Guelph Agricultural College, Canada, upon the control of smut (*Ustilago crameri*) of foxtail millet [*Setaria italica*: *R.A.M.*, vii, p. 238], in which the untreated seed gave a crop 56 per cent. smutted, the best results were given by 0·25 per cent. solutions of semesan and uspulun, and by Du Pont No. 12 and copper carbonate dusts [quantities unspecified]; these reduced infection to 1·9, 0·9, 0·6, and 1 per cent., respectively. Formalin sprinkle and soak prevented germination, which was also checked by the dry formaldehyde treatment [ibid., v, p. 414].

BARGER (W. R.). **Sodium bi-carbonate as Citrus fruit disinfectant.**—*California Citrograph*, xiii, 5, pp. 164, 172–174, 1 fig., 1 graph, 1928.

This paper describes experiments conducted in California, in which commercial oranges and others that were wounded and brushed with the spores of *Penicillium digitatum* and *P. italicum* [*R.A.M.*, vii, p. 238] were immersed for 4 minutes in different solutions contaminated with the same organisms, and then dried, wrapped, packed, and stored for six weeks under conditions conducive to decay.

A preliminary inspection, made after sweating of the fruit but before washing or treatment, of 500 boxes of navel oranges in eight packing houses revealed about 1 per cent. rot; of the decayed oranges 52 per cent. were affected by *P. digitatum* only, 32 per cent. by both this and *P. italicum*, 11 per cent. by the latter only, and 5 per cent. by other forms of decay.

Injured inoculated Valencia oranges immersed in water, 4 to 5 per cent. sodium borate solution, or 4 to 6 per cent. sodium bicarbonate solution, each at 100° F. and all contaminated with the spores, showed, after six weeks' storage, 96·6, 96·8, and 79·7 per cent. infection, respectively. Injured inoculated navel oranges immersed in (contaminated) water at 90°, 4·5 per cent. sodium borate solution, 3 and 5 per cent. sodium bicarbonate at 95°, and 5 per cent. sodium bicarbonate at 60°, showed 86, 69·3, 35·3, 32, and 34 per cent. infection, respectively, in six weeks. Thus, a 3 per cent. solution of sodium bicarbonate was approximately as effective as one of 5 per cent., and a temperature of 60° as effective as one of 95°.

P. italicum was the commonest cause of decay in the injured, inoculated fruit treated with the sodium borates, and both this and *P. digitatum* were found on the oranges treated with sodium bicarbonate.

Commercial Valencia oranges were immersed in (contaminated) water, 4 to 5 per cent. sodium borate solution, or 4 to 6 per cent. sodium bicarbonate solution, at 100°. The figures for infection after six weeks were 28·3, 18·2, and 16·7 per cent., respectively. Both moulds developed to about an equal extent on the fruit treated with sodium borate, on which also more than 10 per cent. of the decay was caused by *Alternaria* [*citri*] and *Colletotrichum* [*gloeosporioides*] [ibid., iv, p. 539]. These last two slow-growing fungi also accounted for 3 per cent. of the decay in the water-immersed fruit and 4 per cent. of that in the fruit immersed in the sodium bicarbonate. Immersion in 3 per cent. and 5 to 6 per cent. sodium bicarbonate gave 17 and 16·1 per cent. infection, respectively. Commercial navel oranges immersed in water and 2·5 to 3 per cent. sodium bicarbonate solution at 90° subsequently showed 10·8 and 5·8 per cent. infection, respectively.

SIBILIA (C.). **Batteriosi del Cotone.** [A bacterial disease of Cotton.]—*Boll. R. Staz. Pat. Veg.*, N.S., viii, 1, pp. 93–96. 1 fig., 1928.

Towards the end of 1927 the author received from the Italian Protectorate of Erythrea, on the Red Sea, a cotton plant preserved in alcohol showing lesions on the stem, branches, and boll (no leaves were present), in the diseased tissues of which an organism which was identified as *Bacterium malvacearum* was abundantly present.

MÉTALINKOV (S.) & TOUMANOFF (K.). **Recherches expérimentales sur l'infection de Pyrausta nubilalis par des champignons entomophytes.** [Experimental researches on the infection of *Pyrausta nubilalis* by entomogenous fungi.]—*Comptes rendus Soc. de Biol.*, xcviii, 8, pp. 583–584, 1928.

Positive results were given in a series of inoculation experiments on the caterpillars of *Pyrausta nubilalis* [*R.A.M.*, vi, p. 547], found in great numbers on mugwort [*Artemisia vulgaris*] near Paris, with *Aspergillus flavus*, *Botrytis* [*Beauveria*] *bassiana*, *Isaria farinosa*, and *Sterigmatocystis nigra* [*A. niger*: ibid., vi, p. 610]. *A. flavus* was the most virulent of the organisms tested, causing 100 per cent. infection, and *A. niger* the least so. The insects are

readily infected by placing them in contact with sporulating cultures of the fungi, or by spraying them or their host plants with spore suspensions. Infection occurs through the teguments, the fungi being recovered in all cases from the body-cavity of the caterpillars.

GAMNA (C.). **A propos de mycose splénique.** [On splenetic mycosis.]—*La Presse Méd.*, xxxvi, 23, p. 357, 1928.

Oberling's conclusions with regard to the doubtful pathogenicity of the fungi associated with splenetic mycosis [*R.A.M.*, vii, p. 378] accord completely with those of the author. Only in three or four cases of splenomegaly have fungi been isolated and cultured, and no definite evidence of their instrumentality in the causation of the disease is available.

FERGUSON (A. S.). **Blastomycosis of eye and face secondary to lung infection.**—*Brit. Med. Journ.*, 3506, pp. 442–443, 2 figs., 1928.

The case of a patient suffering from blastomycosis of the eye and face as a sequel to moniliasis of the lungs is briefly reported. The latter condition is stated to be of frequent occurrence in Jersey, Channel Islands, mostly in association with tuberculosis.

DA FONSECA (O.) & LEAO (A. E. DE A.). **Dermatite blastomycosique.** [Blastomycotic dermatitis.]—*Comptes rendus Soc. de Biol.*, xcviii, 8, pp. 622–623, 1928.

The case is described of a white Brazilian labourer, aged 39, who suffered from blastomycotic dermatitis, not hitherto reported at Rio de Janeiro. The patient's condition steadily deteriorated and he died as a result of general cachexy. Sections through the lesions disclosed the presence of a fungus believed to be identical with *Mycoderma dermatitidis* Gilchrist and Stokes, 1898.

VAN DER MEER (JIKKE H. H.). **Vlasbrand (brûlure du Lin).** [Flax fire.]—*Tijdschr. over Plantenziekten*, xxxiv, 4, pp. 126–146, 4 pl., 1928. [French summary.]

In June, 1927, the author visited a number of flax-growing areas in Friesland and Groningen (Holland), in which some of the plants were affected by 'fire', associated with *Asterocystis radicis* and *Pythium megalacanthum* [*R.A.M.*, vi, p. 381; vii, p. 202].

The disease appears during the latter part of May to the beginning of July, when the plants are 5 to 10 cm. in length, and generally occurs in small patches about 20 cm. in diameter. The centre of these patches is occupied by stunted plants with stalks about 1 to 6 cm. in length and 0·5 to 1 mm. in thickness. The leaves are brown and shrivelled to half way up the stalk or above; the foliage of the next section is brown and dry at the tip and yellow at the base; the leaves approaching the top of the plant are limp and yellow at the tip and green at the base; while the uppermost leaves are still green and turgescent. The internodes of the upper part of the plant are shortened, so that the leaves grow close together. Sometimes lateral shoots develop in the axils of the lower leaves.

These symptoms become progressively slighter in plants nearer the edge of the patch.

When these patches spread, an apparently vigorous stand may be destroyed in five days, and cases are known in which less than half of the crop has been harvested. The very stunted plants die, but those less severely affected may recover under favourable conditions. Some growers have observed that the resistance of the crop is strengthened by warm weather. The damage caused by flax fire may amount to between 400 and 500 florins [about £33 6*s*. 8*d*. to £41 13*s*. 4*d*.] per hect. As a rule flax is rotated with other crops at six- to ten-yearly intervals. The best quality is produced on light clay soils, but in view of the severity of the fire disease on such ground, the practice of cultivating flax on heavy clay is gradually becoming established. The persistence of flax fire is remarkable, the typical symptoms being observed in fields where this crop has not been grown for 20 to 25 years, but it also sometimes occurs in the first stands on ground newly reclaimed from the sea. The opinion is prevalent that late sowing reduces the incidence of the disease, while cold, damp spring weather favours infection. The blue-flowering variety, which produces the superior grades of flax, is more severely affected by fire than the white one.

The microscopic examination of the root system of infected plants shows translucent, sometimes broken areas, through which the central cylinder can be seen. The echinulate oogonia of *P. megalacanthum* were found to be constantly present in the diseased material, while of the other two fungi that were generally found in diseased samples, *A. radicis* was in much less quantity than *P. megalacanthum* and *Thielavia basicola* was found in only a small proportion of the affected roots. The last-named organism is considered to play no part in the causation of fire, while *A. radicis* is only of secondary importance, both these fungi being sometimes absent in typical cases of the disease. The results of inoculation experiments [which are fully described] with these three organisms confirmed the above observations, *P. megalacanthum* alone being capable of producing the typical symptoms of fire on the aerial organs and root system of unwounded inoculated plants. At the most *A. radicis* and *T. basicola* can only aggravate the symptoms caused by *P. megalacanthum*, which must be regarded as the chief agent of infection in Holland.

Considerable differences in varietal reaction to the disease were shown, Svalöf's Blenda, Herkules, and white-flowering, Van Lochow 3, 4, and 7, Alba, Texala, and others being susceptible, while L.B. 1663, Egyptian, Gruno, and B 21 were relatively resistant, and Italian apparently immune.

HENRY (A. W.). **Reaction of Linum species of various chromosome numbers to rust and powdery mildew.**—Abs. in *Scient. Agric.*, viii, 7, pp. 460–461, 1928.

In experiments at Edmonton, Alberta, with species of *Linum* having various chromosome numbers, certain strains of *L. usitatissimum*, *L. angustifolium*, *L. crepitans*, *L. rigidum*, and *L. sulcatum*

proved completely susceptible when inoculated with *Melampsora lini* [f. sp.] *liniperda* from *L. usitatissimum*, while other strains of *L. usitatissimum* and *L. angustifolium*, as well as *L. perenne*, *L. austriacum*, *L. grandiflorum*, *L. flavum*, and *L. catharticum* proved to be immune; *M. lini* [f. sp.] *cathartici* from *L. catharticum* also infected *L. rigidum* but none of the other species of *Linum* tested. An *Oidium* which developed abundantly on all varieties on *L. usitatissimum* in a greenhouse at Cambridge [(?) *Erysiphe polygoni*: *R.A.M.*, vi, p. 727] also produced identical symptoms on *L. angustifolium* and *L. crepitans* in Alberta, but all the other species tested were immune except *L. perenne*, *L. austriacum*, and *L. rigidum*, which developed slight traces of infection. The results of the inoculations with *M. lini* f. sp. *liniperda* and the *Oidium* support the view that *L. angustifolium* is the wild ancestor of *L. usitatissimum*, and also indicate that *L. crepitans* is closely related to these two species.

SCHILLING (E.). **Zur Frage der Trockenbeizung von Leinsaat.** [On the question of the dusting of Flax seed.]—*Faserforsch.*, vi, 3, pp. 105–115, 1928.

None of the 14 dusts tested at the Fibre Research Institute, Sorau, Niederlausitz [Saxony] for the control of *Fusarium* [*lini*] and *Colletotrichum* [*lini*] proved effective in cases of severe internal infection. The following dusts increased the quantity and improved the quality of the straw: agfa tr. 30, höchst [tillantin], uspulun [tillantin R], and germisan, the first-named being particularly efficacious.

SMITH (G.). **The identification of fungi causing mildew in Cotton goods: the genus Aspergillus.**—*Journ. Text. Inst.*, xix, 3, pp. T92–T100, 4 pl., 1928.

After describing the general morphology of the genus *Aspergillus* with special reference to the growth of these organisms on cotton goods [*R.A.M.*, v, p. 280], the author gives an account of the cultural characteristics of the following species, which are responsible for a very large proportion of the cases of mildew in cotton goods.

Group I comprises all species hitherto identified as the causal agents of mildew of yarns and cloths, and includes *A. flavus*, *A. fumigatus*, *A. glaucus*, *A. niger*, *A. repens*, *A. ruber*, *A. sydowi*, *A. terreus*, *A. versicolor*, and *A. wentii*. Of these, the commonest green species is *A. repens*; *A. niger*, *A. ruber*, and *A. versicolor* are fairly frequent on cotton cloth shipped to the East; and *A. terreus* appears to cause the most severe injury to the cloth, though less common than some of the others.

Group II, comprising species commonly occurring as spore infections of commercial yarns but not found actually growing on cotton goods, includes *A. candidus*, *A. chevalieri*, *A. effusus*, *A. flavipes*, *A. nidulans*, *A. ochraceus*, and *A. tamari*. The author states that some of these have since been transferred to group I, and the others are possible causes of mildew injury.

Nicolas (G.) & Aggéry (Mlle). **Un nouvel Heterosporium parasite de l'Iris germanica L.** [A new *Heterosporium* parasitic on *Iris germanica* L.]—*Rev. Path. Vég. et Ent. Agric.*, xv, 3, pp. 62–66, 20 figs., 1928.

At Toulouse in May, 1927, the authors identified a species of *Heterosporium* from the leaves of *Iris germanica* showing sparse oval or elliptical spots having a grey, dried-up centre surrounded by a brown or reddish-brown margin. The leaf tissues became discoloured round the spots, and finally dried up.

The conidiophores, which measure 68 to 310 by 9 to 12 μ, are erect, nodose, brown, multiseptate, and sometimes branched. A single conidium is borne terminally but is pushed over to one side as the conidiophore continues to elongate; a small protrusion remains, marking the point of attachment of the spore, and the process may be repeated until up to 5 conidia are borne. The latter measure 32 to 98 by 14·1 to 22 μ, are seldom unicellular, generally 1- to 7- septate, constricted at the first septum from the base (giving the conidium the appearance of a footprint), and show a protrusion corresponding to that on the conidiophore.

In view of these characters, which do not agree with those of other fungi known on *Iris*, the authors consider the parasite to be a new species, for which they propose the name *H. pruneti*. A Latin diagnosis is given, together with a table comparing the fungus with the allied *Iris* parasites, *H. gracile* and *H. montenegrinum*.

Dowson (W. J.). **On an extraordinary Botrytis causing a disease of Narcissus leaves.**—*Trans. Brit. Mycol. Soc.*, xiii, 1–2, pp. 95–102, 1 pl., 3 figs., 1928.

This is a full account of the morphology and cultural characters of *Botrytis polyblastis*, the cause of the 'fire' disease of narcissus leaves in the south-west of England and in North Ireland, a more popular description of which was already given in a previous paper by the author [*R.A.M.*, v, p. 740].

Simonet. **Note sur une maladie cryptogamique de Mahonia japonica, var. bealei.** [Note on a cryptogamic disease of *Mahonia japonica* var. *bealei*.]—*Bull. Mens. Soc. Nat. Hort. de France*, Sér. V, i, pp. 133–134, 1 fig., 1928.

In February, 1925, the inflorescences of *Mahonia japonica* var. *bealei* were observed to be infected by a fungus identified as *Sclerotinia fuckeliana* [*R.A.M.*, vi, p. 644], which originated at the tip of the raceme and gradually spread downwards. Pure cultures of the fungus were obtained and its presence was again noted during the winter of 1926–7. Other shrubs in proximity to the diseased bushes were also infected, while the type species *M. japonica* remained immune.

Hornig (A.). **Die Kakteenfäule.** [Cactus rot.]—*Zeitschr. für Sukkulentenkunde*, iii, 11, p. 232, 1928.

Cacti and other succulent plants are stated to be liable to severe infection by *Phytophthora cactorum*, which causes a black, slimy rot of the root-collar. The white hyphae of the fungus penetrate

the soil to a depth of 2 cm. In addition to the excision of diseased material, the writer recommends five minutes' immersion of healthy plants exposed to infection in uspulun solution (100 gm. per 2 l. of water).

GRÜSS (J.). **Phylloseptie, die Blattfäulnis der Nymphaea alba.** [Phyllosepsis, the leaf rot of *Nymphaea alba.*]—*Centralbl. für Bakt.*, Ab. 2, lxxiv, 8–14, pp. 214–229, 19 figs., 1928.

In July, 1927, the writer observed that the floating leaves and petioles of *Nymphaea alba* on the Teufelssee near Friedrichshagen [outskirts of Berlin], showed a yellow or light brownish discoloration, which the author claims to have proved to be due to two new species of *Coccus* named *C. phylloseptieus* and *C. zymophylloseptieus* [the morphological and cultural characters of which are fully described]. The second organism was not detected until September, probably because the agar medium used in the first isolation experiments was less suitable for its development than the beerwort employed in the second series. There is stated to be no doubt, however, since inoculations with both organisms gave positive results, that *C. zymophylloseptieus* was partially responsible for the diseased condition of the foliage. *C. phylloseptieus* is globular and measures about 1 μ, while *C. zymophylloseptieus* is globular to elliptical and averages 0·8 μ in size.

PULSELLI (A.). **Un parassita di alcune specie di Lupinus e di Cytisus. (Ceratophorum setosum Kirch. (1892).)** [A parasite of certain species of *Lupinus* and *Cytisus.* (*Ceratophorum setosum* Kirch. (1892).)]—*Boll. R. Staz. Pat. Veg.*, N.S., viii, 1, pp. 50–85, 20 figs., 1928.

In February, 1927, the author observed young plants of *Lupinus albus* grown near Rome, which were severely affected by *Chalaropsis thielavioides* [*R.A.M.*, vi, p. 731], while in the lesions caused by this parasite the fusiform, 4- to 6-septate spores of another fungus, identified as *Ceratophorum setosum* [ibid., v, p. 391], were present in quantity. The apical hyaline cell of these spores bore long appendages generally arranged in groups of four, one (which was sometimes bi- or tripartite) being situated on the upper part of the cell, and the other three, usually simple, arranged at the base of the cell at right angles to the longitudinal axis of the spore. In culture the spores were usually 5- septate and measured 70 to 110 by 18 to 30 μ (mostly 80 to 90 by 20 to 25 μ), while the terminal appendage may be up to 200 μ in length by 5 to 11 μ broad at the base. The lateral appendages are generally rather smaller.

The cultural and biological characters of *C. setosum* on different media are described in considerable detail. It grows readily on many common nutritive media, especially those with a neutral or alkaline reaction. On neutral or acid media the mycelium is usually filamentous, white on the surface and dark in the under layers; on alkaline media the mycelium is generally dark, and groups of dark, round cells (chlamydospores) may be formed. These vary from 10 to 30 μ in diameter according to their age. Germination is most rapid at temperatures between 20° and 28° C., but the fungus fructifies most freely at 10° to 15°.

Inoculations of young plants of *L. albus* and *Cytisus adami* with the spores and mycelium of *C. setosum* gave positive results, cotyledons, leaves, and stems becoming infected when wounded. When inoculated near the ground level the plants became affected by a rot in which secondary organisms played a prominent part. *L. albus* shows a certain degree of resistance to attack and it is suggested that, in the author's case, infection was favoured by the previous attacks of the *Chalaropsis*.

As the fungus in nature shows superficial fructifications, not acervuli, it cannot be considered to belong to the Melanconiaceae; from its shape, dimensions, the appearance of the appendages, the lack of a pedicel, and the other differences described by Doyer [loc. cit.], it cannot be a *Pestalozzia*. Further, as the mycelium, spores, and chlamydospores are dark, it cannot be a *Mastigosporium*. The author agrees with Doyer that the best name is *C. setosum*, and proposes to divide the genus *Ceratophorum* into two subgenera, *Monochaeta* and *Pleiochaeta*, to include, respectively, the species in which the conidia have one appendage, and those in which they have two or more. An amended Latin diagnosis is given and there is a bibliography of 17 titles.

SAMPSON (KATHLEEN). **Comparative studies of Kabatiella caulivora (Kirchn.) Karak. and Colletotrichum trifolii Bain and Essary, two fungi which cause Red Clover anthracnose.**—*Trans. Brit. Mycol. Soc.*, xiii, 1–2, pp. 103–142, 3 pl., 6 figs., 1928.

The main scope of the investigation reported at length in this paper was to elucidate the synonymy and to add to the knowledge of the group of diseases known under the name of anthracnose of red clover, for which purpose the author made a comparative study of the anthracnose of red clover (*Trifolium pratense*) which appeared in 1920 at the Welsh Plant Breeding Station [*R.A.M.*, i, p. 422; v, p. 469] and of a strain of *Colletotrichum trifolii* [ibid., vii, p. 448] obtained from America. The characters of the local fungus closely agreed with the description of *Gloeosporium caulivorum*, for which the author, in view of Karakulin's discussion of its systematic position [ibid., iv, p. 129] and of her own observations, adopts the name of *Kabatiella caulivora* (Kirchn.) Karak.

K. caulivora has been recorded in eleven counties of England and Wales. Its attack in the field is almost entirely confined to the stems and petioles of red clover, although occasionally the leaf blades may also be invaded. On the latter the lesions are at first dark in colour and the margin of the injured area is clearly defined on both surfaces. On the stems, the first sign of infection is a small dark spot which spreads chiefly in the longitudinal direction, and which is slightly sunken below the surrounding healthy tissue. As the spots increase in size, their central part becomes lighter in colour, and as the stem grows in length and thickness, a slit often appears in the centre of the lesion. Acervuli, each consisting of a cluster of basidium-like conidiophores bearing terminally a group of continuous, sickle-shaped conidia, are abundant within the pith cavity and on the surface of the stem lesion if the atmosphere is not too dry. The general result of the attack in the field is the pro-

duction of shrivelled leaves and broken stems. The lesions are often found just below the flower head, and the disease then interferes, sometimes very seriously, with seed production.

On artificial media the germination of the conidia is characterized by the early and repeated budding off of fresh conidia and by the scanty development of mycelium. At first, the growth resembles that of a bacterial streak culture, but later it becomes black and small and definite pycnidia are formed. On the host the conidia germinate by the protrusion of a slender germ-tube which grows at first in the cell wall immediately below the cuticle. Growth in the host is preceded by a brown discoloration of the cell walls and a lysis of the cell contents. The mycelium is almost entirely intercellular. The pathogenicity of the organism to red clover was proved by inoculations with cultures obtained from single spore isolations. Artificial infection also gave positive results on *Trifolium repens* and *T. hybridum*, but *T. incarnatum*, *Medicago lupulina*, and *M. sativa* appeared to be immune. In the field, late flowering clovers were found, on the whole, to be more resistant than the early flowering strains. Seed artificially contaminated with the spores of the fungus gave rise to diseased seedlings, the fungus developing on the cotyledons and first leaves.

Inoculation experiments on red clover with a pure culture of *Colletotrichum trifolii* received from America resulted in the infection of the stems and petioles of the plants. The lesions were usually lighter in colour than those caused by *K. caulivora*, and did not develop a hollow centre. The mycelium of the fungus was found abundantly in the cortex, pith, and thin-walled cells of the vascular bundles, and was largely intracellular. The acervuli were accompanied by numerous black setae. The spores are straight, cylindrical, and produced singly on slender conidiophores which arise from a slight stroma. On nutrient media, the conidia germinate by the production of bipolar germ-tubes, which branch and give rise to a circular growth of mycelium. The latter develops a dark pigment, and gives rise to pink acervuli of conidia and setae similar to those produced on the host. Appressoria are developed in culture and on the host immediately the spores germinate. The fungus was found capable of infecting also *T. incarnatum*, *Medicago lupulina*, *M. sativa*, and *T. hybridum*, but not *T. repens* or *T. medium*. Seedlings raised from seed contaminated with spores developed the disease after three weeks on the hypocotyl and cotyledons.

A bibliography of 45 titles is appended.

HEDGES (FLORENCE). **Bacterial halo spot of Kudzu caused by Bacterium puerariae Hedges.**—*Journ. Agric. Res.*, xxxvi, 5, pp. 419–428, 2 pl., 1928.

The bacterial halo spot disease of the Kudzu vine (*Pueraria thunbergiana*), fully dealt with in this paper, has already formed the object of a preliminary report by the author, an abstract of which has been noted [*R.A.M.*, vi, p. 422]. In the United States it is known to occur in Georgia, Florida, and Connecticut, where it is of some economic importance because the Kudzu vine is being increasingly used as a forage crop.

A detailed description is given of the morphology and cultural characters of the causal organism, *Bacterium puerariae*, the pathogenicity of which to the Kudzu vine was proved by pure culture inoculations. It was also shown to be infectious to the Lima bean [*Phaseolus lunatus*]. Field observations supplied circumstantial evidence that the disease is spread to new areas by planting them with roots from diseased fields. This is supported by the fact that the organism is capable of retaining its viability for a long time at low temperatures, long-continued growth being possible for it at about 2·5° C. The author believes that it lives over winter in dead leaves of the host, bits of which remain attached to the transplanted roots and act as centres of infection in the spring. The necessity is therefore stressed of using planting material from disease-free fields. The use of cuttings should be avoided, as the succulent young runners are very susceptible to infection and might serve as carriers of the disease.

BROOKS (F. T.). **On the occurrence of Phacidiella discolor (Mout. & Sacc.) Potebnia in England.**—*Trans. Brit. Mycol. Soc.*, xiii, 1–2, pp. 75–81, 2 pl., 1928.

Details are given of comparative cultural work which has shown that the pycnidial fungus recently described by Southee and Brooks as associated with a die-back and canker of apple trees in England [*R.A.M.*, vi, p. 236], is identical with *Phacidiella discolor* recorded by Potebnia [*Zeitschr. f. Pflanzenkrankh.*, xxii, p. 129, 1912]. It was further shown that *Fuckelia conspicua* Marchal [and probably also *Pyrenochaeta furfuracea* (Fr.) Rostrup] is identical with the pycnidial stage of *P. discolor*, for which Potebnia's name *Phacidiopycnis malorum* is considered to be the best for the present.

GREGORY (F. G.) & HORNE (A. S.). **A quantitative study of fungal invasion of the Apple fruit and its bearing on the nature of disease resistance.—Part I. A statistical method of studying fungal invasion.**—*Proc. Roy. Soc.*, Ser. B., cii, B. 719, pp. 427–443, 6 graphs, 1928.

A detailed account is given of a standard method devised by the authors, in the course of the investigation of the incidence of disease in apples in cool storage [*R.A.M.*, vi, p. 623], for the evaluation of the advance of various fungi in the tissues of apples of different varieties inoculated with them. The fungi used in the experiments were *Botrytis* sp., *Cytosporina ludibunda*, *Fusarium* [*fructigenum*: ibid., iii, p. 558; vii, p. 476], *Pleospora pomorum*, and *Polyopeus aureus*, and the varieties of apples tested were Cox's Orange Pippin and Bramley's Seedling. The results of upwards of 15,000 inoculations during various periods of storage life and at different temperatures showed that, since the apple approximates to a sphere of a very limited size as compared with the infected volume, the relation between the weight of tissue rotted and the penetration of the fungus is of a complex nature, thus rendering the weight of rotted material obtained during two consecutive equal periods of time unreliable as a measure of the progress of the fungus, even though the penetration of the latter is at a uniform

rate. The new measure suggested is the 'radial advance' of the fungus inside the apple. It is claimed that calculations have shown that this measure is constant over equal intervals of time at a uniform rate of invasion, irrespective of the stage of invasion reached, and that its distribution curve is only moderately asymmetric. The standard error of the mean of radial advance is said to be less than half that of percentage weights, thus indicating a much greater accuracy in its use.

The experiments also showed that each individual apple in a given sample has a characteristic resistance, as indicated by: (1) the high positive relation obtaining between the radial advance at the opposite sides of individual apples inoculated at two or four points diametrically opposed to each other in pairs, namely: $r = +0{\cdot}694$ (in 116 apples inoculated at 2 points), and $r = +0{\cdot}742$ (in 20 apples inoculated at 4 points); and (2) by the high correlation found to hold between the radial advances obtained for two successive inoculations of the same individuals by the same fungus, namely: $r = +0{\cdot}816$ (in 10 apples).

Horne (A. S.) & Gregory (F. G.). **A quantitative study of fungal invasion of the Apple fruit, and its bearing on the nature of disease resistance.—Part II. The application of the statistical method to certain specific problems.**—*Proc. Roy. Soc.*, Ser. B, cii, B. 719, pp. 444–466, 4 graphs, 1928.

In this paper the authors discuss some practical applications of the method devised by them for the measuring of the progress of invasion of apples in cool storage by various fungi [see preceding abstract]. The results of their work on these lines and using the same parasitic organisms as before, indicated that the rate of invasion in an individual apple of a given variety does not remain constant, but may rise or fall in time, according to the variety used and the experimental conditions. An unmistakable similarity was noted in the drift of the rate of growth of the fungi, taken as a whole; it fell rapidly in each case until the neighbourhood of the fiftieth day from inoculation, where a minimum occurred, and subsequently in most cases there was an increase in the growth-rate.

A comparison of the behaviour of the various strains of *Fusarium* [*fructigenum*] used showed that their virulence decreases in an order which is independent of the variety of apple and the seasonal changes, but is affected by the temperature of storage. All the saltants tested exhibited a lower virulence than the parent strains.

A very marked influence was found to be exerted by the locality of origin on the resistance of apples of a given variety, and a correlation was traced between the varying degree of resistance and the differences in chemical composition of the apples, as expressed by the equations: ${}^{r}RN.K = +0{\cdot}737$ and ${}^{r}RK.N = -0{\cdot}282$, where R is the radial advance, and K and N are, respectively, the percentage of potassium and of nitrogen in the fresh weight of the apples.

All the data collected tended to show that resistance in the apples to fungal invasion is complex in its nature, and depends on many factors, e. g., water content, acidity, nitrogen and potassium content. Of these factors, low water content, high acidity, high potassium

content, and low nitrogen content were found to be associated with high resistance, the converse being also true.

BENSAUDE M[ATHILDE] & KEITT (G. W.). **Comparative studies of certain Cladosporium diseases of stone fruits.**—*Phytopath.*, xviii, 4, pp. 313–329, 5 figs., 3 graphs, 1928.

In this paper the writers describe the results of their comparative studies, conducted in Wisconsin during 1922, on the *Cladosporium* diseases of peach, plum, apricot, and cherry.

The symptoms of the disease caused by *C. carpophilum* on peach are well known [*R.A.M.*, ii, p. 127 *et passim*], but less attention has been paid to the signs of infection on the other hosts. On wild plums (*Prunus americana*) the lesions first appeared on the fruit about 15th June in the form of small, circular, olivaceous patches, the central part of which later assumed a brown, corky aspect, while a red halo developed round the spots. On the ripe fruit the lesions were fairly sharply defined by a slightly raised border. In the later stages the fungus continued to grow in the subcuticular region, forming a pseudoparenchymatous structure from several to many cells in thickness. Lesions also occurred on the pedicels, twigs, and leaves, the last-named organs, however, being little affected.

The only lesions on apricot (*P. armeniaca*) available for examination were those induced by inoculation on the twigs and foliage. The spots on the twigs developed similarly to those on peach and plum. The lesions on the leaves were pale olivaceous yellow at first, later assuming a brighter tint, and frequently becoming confluent. Infection was always more abundant on the lower surface and occurred on the lamina, veins, midrib, or petiole.

On the fruit of Early Richmond cherry (*P. cerasus*) trees the pink, later dull red or brown lesions with brighter margins ranged from 0·5 to 2 mm. in diameter when fully developed. On twigs the infected areas were irregular to oval, imperfectly defined, brownish, and with a maximum diameter of about 0·5 mm. The lesions produced on the foliage were very inconspicuous.

Studies on the mode of penetration of *C. carpophilum* were carried out on Superba apricot leaves with a suspension of a monospore strain isolated from plum and cultured on Lima bean agar. By the second day after inoculation a high percentage of the spores had germinated with one to three germ-tubes of varying length. Those from which penetration was observed to occur were comparatively short (7 to 35 μ long). Abundant infection had occurred by the fourth day after inoculation, and it appears probable, from field observations and by analogy with closely related fungi, that penetration actually takes place considerably sooner. Penetration occurred at or near the apex of the germ-tube, without the formation of a well-defined appressorium, the lumen of the penetrating hypha being visible as a delicate, circular orifice. The mycelium was first apparent as a small rosette near the point of penetration. With further growth, flattened, ribbon-like strands of subcuticular mycelium developed, frequently following roughly the outline of the epidermal cells. Conidiophores were borne profusely from the mycelium and emerged by freely penetrating the cuticle.

A comparative biometrical examination of the conidiophores and conidia of the different strains of the *Cladosporium* showed that those from peach and *P. americana* were closely similar, while the conidia of the cherry strain are slightly shorter. The significance of this difference, however, is considered doubtful in view of the limited amount of available material. The *Cladosporium* from cherry further differed from the others studied in its long, slender germ-tubes and in the relatively sparse septation of its young thalli. It also seems to have a lower temperature range than the *P. americana* and peach strains, good growth occurring at 13° to 16°, with an optimum at 19° to 26°, and a maximum at 28° to 31°. The peach and *P. americana* strains made little growth below 16°, their optimum ranging from 19° to 28°, and development being still fairly profuse at 31° to 33°.

In cross-inoculation experiments, the strains of *Cladosporium* from peach and *P. americana* infected each other's host and apricot, but not cherry or cultivated plum (*P. domestica*). The cherry strain infected its own host but not peach, *P. americana*, or apricot.

Pathologically and physiologically, therefore, the strains of *Cladosporium* studied appear to fall into two groups: (1) those from peach and *P. americana*, and (2) that from cherry. Their genetic and taxonomic relationships are likely to remain doubtful until more is known of their possible ascigerous stages. Meanwhile, the peach and *P. americana* strains are tentatively regarded as identical and referred to *C. carpophilum*, while the cherry fungus is thought to be probably the same as *Venturia cerasi* Aderh. (*C. cerasi* (Rabenh.) Sacc.).

[HARLAND (S. C.).] **Report by Dr. Harland on his tour for the purpose of studying Bananas and Citrus.**—*Trop. Agriculture*, v, 2, pp. 23–24; 3, pp. 54–56; 4, pp. 90–91, 1928.

In this report the author gives a concise account of his tour in 1925 through Panama, California, the Pacific Islands, Japan, Malaya, Burma, and Ceylon, for the purpose of gaining information on the original home of the Gros Michel variety of banana in connexion with the search for banana varieties resistant to the Panama disease [*Fusarium cubense*]. At the same time he also made notes on *Citrus* varieties with a view to finding some similar means for the control of wither-tip [*Gloeosporium limetticolum*: *R.A.M.*, vii, p. 373].

As the outcome of his investigations, he considers south-eastern Asia to be the original home of the banana, principally owing to the wide diversity of types existing there, and to the existence of several wild species of *Musa*. The Gros Michel and allied types were found to occur from Singapore through the whole of the Malay Peninsula, extending northwards into Upper Burma as far as Mandalay, thus indicating that this type at least is a native of south-eastern Asia. It is pointed out that it would be important to trace the exact geographical distribution of this variety, for the wider the area from which planting material is obtained, the greater will be the chance of getting favourable physiological variations exhibiting immunity from, or high resistance to, the Panama disease.

South-eastern Asia is also believed to be the original home of the lime, as the supposed wild form of cultivated limes, *Citrus hystrix*, is widely distributed in the foot-hills of Burma. Several new and promising types were collected in Mandalay and Toungoo.

Some brief notes are also given on certain banana diseases which were observed in the localities visited. In particular it was found that bunchy top of bananas is widely distributed over the whole of Ceylon, having probably been introduced from Fiji some years previously. This would render the introduction of any variety from Ceylon into the West Indies a very dangerous procedure, without at least two years' quarantine. In Malaya the writer observed three diseases not previously encountered: (1) a pseudostem rot, beginning with the shoot and extending downwards towards the rhizome; (2) leaf disease causing a progressive die-back from the margins inwards; and (3) a very dangerous disease apparently caused by a mildew, which rots the fruit when about an inch long and causes the destruction of the entire bunch.

Schirmer (K.). **Vom Saatbeizen.** [On seed steeping.]—56 pp., 22 figs., Freising-München, F. P. Datterer & Cie., 1927. [Abs. in *Fortschr. der Landw.*, iii, 6, p. 272, 1928.]

The reviewer (G. O. Appel) regards this work as a very valuable contribution to the practical and scientific aspects of seed disinfection. The historical development of the process is described, with a discussion on the properties of copper sulphate, formalin, and the mercurial and arsenical preparations. The symptoms of the various fungous diseases of cereals are briefly described, with special reference to the difference between seedling and blossom infection and the use of chemical preparations or the hot water treatment. The different methods of disinfection (immersion, sprinkling, the use of small quantities of liquid at high concentrations, and dusting) are discussed, together with observations on the questions of reinfection and the cost of treatment. The respective merits of various fungicidal preparations are indicated, and a table is appended showing the disinfectants recommended by the German Plant Protection Service.

Gram (E.). **Afsvampningsforsøgene 1927.** [Disinfection experiments 1927.]—*Ugeskr. for Landmaend*, lxxiii, 13, pp. 195–196; 14, pp. 209–211, 1928.

The writer presents and discusses the results, based on the reports issued at regular intervals by the local agricultural bodies, of the seed disinfection trials conducted in Denmark during 1927. Root rot of beets [*Phoma betae, Pythium de Baryanum*, and other organisms: *R.A.M.*, vi, p. 649] was well controlled by dusting with tillantin C or tutan, the former (10 gm. per kg. seed) in one case doubling the germination percentage and greatly increasing the yield.

The incidence of loose smut of oats [*Ustilago avenae*] in Denmark is stated to be negligible, and seed-disinfection tests are mainly based on the control of slime fungi [*Fusarium* spp.]. An average increase of 4 to 5 per cent. in the yield of grain was obtained by 30 minutes' immersion in germisan or uspulun-universal and by

dusting with tillantin C, while in one test tutan dust also proved effective.

In connexion with the results of the trials in the control of stripe disease [*Helminthosporium gramineum*] and slime fungi [*F.* spp.] on barley, the writer recapitulates his directions for the quantities of various preparations to be used in the treatment of winter seed-grain [ibid., vii, p. 153]. The use of the standard fungicides led to an increased yield in certain cases even where fungus infection was absent, but no general statement as to the uniform efficacy of treatment for this crop can yet be made.

GOLDSWORTHY (M. C.). **The fungicidal action of liquid lime-sulfur.**—*Phytopath.*, xviii, 4, pp. 355–360, 1 pl., 1928.

In connexion with laboratory studies on the peach rust fungus (*Tranzschelia punctata*) [*Puccinia pruni-spinosae*], it was found that the protoplasm of the uredospores and germ-tubes reacted instantaneously in the presence of liquid lime-sulphur solutions. The lumina of the germ-tubes became filled with what appeared to be globules of plastic sulphur. In order to demonstrate the exact nature of these particles, the following simple method was devised. The slide containing germinating spores sprayed with lime-sulphur is washed with dilute hydrochloric acid to remove the adhering carbonates and thiosulphates, dried, and flooded several times with carbon tetrachloride to free the surfaces of the spores and germ-tubes from sulphur while not interfering with that within the cells. After the evaporation of the tetrachloride, a few drops of sodium hydroxide, N/5 solution, are placed on the slide. The elemental sulphur within the cells is slowly reduced by this solution to sulphide ion, which can be demonstrated by the addition of a few drops of sodium nitroprusside to the hydroxide. The deep violet coloration of the germ-tubes and spores is indicative of the exchange of the NO part of the nitroprusside ion with the sulphide ion from the globules. Thus the plastic globules are shown to be elemental sulphur. Apparently the sulphide sprayed on the spores had entered and been oxidized to some form of elemental sulphur.

It is evident from the writer's data [which are discussed and tabulated] that an injurious effect on the metabolism of the fungus, expressed by reduction in the length of the germ-tubes and in the germinability of the spores, is caused by the application of lime-sulphur in various dilutions up to 1 to 100. The formation of sulphur from sulphide produces an irreversible change in the oxidation-reduction system of the cell. This is manifested by (1) a reduction of the oxidation-reduction potential, and (2) of the hydrogen-ion concentrations. Since the formation of elemental sulphur is coincident with, or followed by, the death of the organism, it seems logical to conclude that this substance represents the final product of a reaction concerned with the oxidative properties of the cell protoplasm, probably influenced to some extent by the alkalinity of the solution.

These results are regarded as confirming Eyre's and Salmon's view (*Journ. Agric. Sci.*, vii, p. 427, 1916; ix, p. 283, 1919) that the toxic properties of sulphide solutions are functions of their respective soluble sulphide content. This conclusion would appear to dispose

of the theory held by Young and others [*R.A.M.*, ii, p. 461] that polysulphide solutions act only when the oxidation of the resultant liberated sulphur is brought about.

LAURSEN (R. S.). **En ny Bordeauxvaedskesprøjte.** [A new Bordeaux mixture spraying apparatus.]—*Ugeskr. for Landmaend*, lxxiii, 13, p. 203; 15, pp. 234-235, 2 figs., 1928.

A brief, popular description is given of the construction and use of a new horse-driven spraying apparatus for Bordeaux mixture, which is stated to have given excellent results in Jutland. The sprayer (obtainable from the Petershaab Maskinfabrik) can be used both for the eradication of charlock [*Brassica sinapis*] and for the control of diseases in the potato field. The mechanism for distributing the spray is driven from the wheel of the cart and the mixture is evenly distributed over a radius of 6 m. It is estimated that some 10 hect. can be treated in a working day.

Vaedskesprederen 'Kartof'. [The Kartof spraying apparatus.] —*Ugeskr. for Landmaend*, lxxiii, 19, p. 296, 1928.

Further particulars are given concerning the application of the new spraying apparatus manufactured by the Petershaab Maskinfabrik [see preceding abstract]. A limited company known as 'Kartof' has been formed for the exploitation of the machine.

GÄUMANN (E.) & DODGE (C. W.). **Comparative morphology of fungi.**—xiv + 701 pp., 406 figs., xlviii diags., New York & London, McGraw-Hill Book Co., 1928.

This is a free English translation and also a revision of Gäumann's 'Vergleichende Morphologie der Pilze', 1926 [*R.A.M.*, v, p. 683], by Dr. C. W. Dodge of Harvard University. Certain parts have been rewritten, and the more important papers published between 1925 and 1927 have been incorporated.

The Phytopathological Service in the Netherlands.—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 13a, 18 pp., 9 figs., 6 maps, 1928.

The scope and activities of the Dutch Phytopathological Service are defined [*R.A.M.*, iv, p. 257]. The staff engaged in the control of insect pests and fungous diseases now consists of a Director, six phytopathologists, ten technical officials, and 23 controllers on field duty. Eight assistants and attendants are employed for experimental work and in the laboratories. A large number of temporary inspectors are also employed to assist in the inspection of plants and produce intended for export. Among other items of interest the following may be mentioned. The number of letters of advice issued in response to inquiries during 1927 was 2,262, compared with 496 in 1919 (when the work of the Service was reorganized on its present basis). The work of the staff in various matters relating to the control of plant diseases is supplemented by the cooperation of over 300 voluntary correspondents, mostly growers or farmers of a certain standing in their own localities. Under the existing Dutch phytopathological laws, the Service is authorized to prescribe control measures against diseases and pests threatening

the cultivation of important crops, and such methods have been enforced in the case of American gooseberry mildew [*Sphaerotheca mors-uvae*], potato wart disease [*Synchytrium endobioticum*], and the yellow bacterial disease of hyacinths [*Pseudomonas hyacinthi*: ibid., vii, p. 174]. During 1927, the number of export certificates issued by the Service amounted to 68,900.

ARCULARIUS (J. J.). **Zytologische Untersuchungen an einigen endotrophen Mykorrhizen.** [Cytological investigations of some endotrophic mycorrhiza.]—*Centralbl. für Bakt.*, Ab. 2, lxxiv, 8–14, pp. 191–207, 1 pl., 13 figs., 1928.

The author describes his cytological investigations of an endotrophic mycorrhiza having the same general characters on all the hosts examined, viz., *Centrosis abortiva*, *Hippophaë rhamnoides*, *Myrica gale*, and *Alnus glutinosa*. The endophyte formed stout hyphae, with coils of finer filaments within the cells. It is not considered to be an Actinomycete, as suggested by various writers. A so-called 'vesicle' stage occurs in *H. rhamnoides*, *M. gale*, and *A. glutinosa* when the hyphae are partially ingested by the host cells. No evidence was obtained that the hyphal walls contain any appreciable quantity of chitin. In *M. gale* and *A. glutinosa* there were also observed cells filled with bodies resembling the bacteroids of the root nodule organism [*Bacterium radicicola*: *R.A.M.*, iii, p. 225], and the presence of this second symbiont is thought to explain the fixation of nitrogen reported by Hiltner (*Landw. Versuchsstat.*, xlvi, p. 153, 1896) for *A. glutinosa*.

WHITE (MOLLIE G.) & WILLAMAN (J. J.). **Biochemistry of plant diseases. X. Fermentation of pentoses by Fusarium lini.**—*Biochem. Journ.*, xxii, 2, pp. 583–591, 4 graphs, 1928.

The results of investigations, carried on in continuation of previous researches at the University of Minnesota, showed that when the flax wilt organism *Fusarium lini*, is grown on xylose, arabinose, or rhamnose, the main products of metabolism are mycelium, carbon dioxide, ethyl alcohol. and a small amount of organic substance precipitated by lead [*R.A.M.*, vi, p. 295]. From 95 to 99 per cent. of the carbon can be accounted for in these products, indicating that there is probably no other of major importance. Of these three pentoses, xylose is most effectually utilized for alcohol production and arabinose for growth, while rhamnose is of little value in either process. During the course of growth in a culture, the ratio of CO_2 to ethyl alcohol is constantly shifting on account of the consumption of alcohol by the fungus.

WHITE (MOLLIE G.) & WILLAMAN (J. J.). **Biochemistry of plant diseases. XI. Fusarium lini and the pyruvic acid theory of alcoholic fermentation.**—*Biochem. Journ.*, xxii, 2, pp. 592–595, 1928.

The results of experiments [which are briefly described] showed that each intermediate compound in the pyruvic acid scheme of alcoholic fermentation (*Science*, lxv, p. 474, 1927) may be utilized by *Fusarium lini* [see preceding abstract], e. g., methylglyoxal (represented by its hydroxy-derivative) as well as a number of

similar compounds. Tochinai has already shown (*Trans. Sapporo Nat. Hist. Soc.*, viii, 1, 1921) that glycerol, another intermediate product, is readily assimilated by the fungus. Although ethyl alcohol was not found in all the cultures, it is probably produced and then consumed by the organism in preference to the original compound. These data, while not affording a proof of the pyruvic acid theory for the flax wilt fungus, do suggest a rather close analogy between the mechanism of alcohol fermentation in yeast and *F. lini*.

Band (P.). **Over invloed van de grondsoort op het pootgoed bij Aardappelen.** [On the influence of the type of soil on seed Potatoes.]—*Tijdschr. over Plantenziekten*, xxxiv, 4, pp. 147–153, 2 diags., 1928.

The results of experiments carried out in 1926 and 1927 to determine the effect of varying types of soil (heavy clay and light sand) on the incidence of virus diseases of potatoes are described. No evidence was obtained, as suggested by Hanken's data [*R.A.M.*, iv, p. 760], that the extent and severity of these diseases are greater on sand than on clay. The higher yields given by crops on the latter type of soil are attributable to the superior germinative capacity of the tubers cultivated under such conditions.

Bushnell (J.). **Do Potato varieties degenerate in warm climates? Examples of vigorous Potato clones in Ohio.**—*Journ. of Heredity*, xix, 3, pp. 132–134, 1 fig., 1928.

Owing to the difficulty of controlling virus diseases, the production of certified seed-potatoes in Ohio is still very limited [*R.A.M.*, vii, p. 265], but apart from this problem there is no indication, in four years' comparative tests with local material and certified seed from northern Michigan, of any degeneration directly due to high summer temperature. The Long John variety, introduced into Ohio from Pennsylvania in 1836, still maintains a high degree of vigour. Carman No. 3 gives excellent yields in south-central Ohio (over 200 bushels per acre above the State average), after 15 years of cultivation. It would appear from the author's observations that degeneration is entirely due to disease and not to the effect of high temperatures.

Tsen-Cheng. **Sur les phénomènes de nécrose dans la Pomme de terre atteinte de la maladie de l'enroulement.** [Necrotic phenomena in Potatoes attacked by the leaf roll disease.]—*Comptes rendus Acad. des Sciences*, clxxxvi, 11, pp. 712–714, 1928.

In continuation of his investigation of the histological conditions that occur in leaf roll diseased potatoes [*R.A.M.*, vii, p. 462], the author made a cytological study of the necrotic changes noted by several other workers as one of the symptoms of the disease, and which have been variously interpreted. He points out that in healthy potatoes, like all vascular plants, the sieve tubes of the stalk are transient elements that normally disappear after functioning for some time, and that such degenerating elements may be found at any time in the healthy plant [ibid., vii, p. 460]. In these cases the tubes entirely disappear without leaving any traces, while

in leaf roll diseased plants, owing to the much denser cell contents in them, the products of the necrosis are more abundant and cannot be resorbed by the plant. Further, in diseased plants the cells around the degenerating sieve tubes always present lesions, manifested by a thickening of the cell walls. Tested microchemically, these walls are found to have undergone a process of lignification and suberization on the side facing towards the necrotic focus, while the face in contact with the protoplasm of the living cell does not show any indication of such a process. This phenomenon is regarded as a defensive reaction of the cells against the action of the products of necrosis. In the initial stage of necrosis of a cell, the content of the latter is very dense, with a hardly discernible vacuole, and the fact that its protoplasm is coloured when stained with neutral red indicates that it is dead. After some time the walls of this cell become thinner, contract, and separate from the neighbouring cells, thus leaving an empty space through which the necrotic substance diffuses and comes in contact with the walls of neighbouring cells, which begin to thicken. In some cases, the necrotic substance appears to be able to penetrate through the pores in the thickened walls, thus involving new cells in the necrotic process.

On the basis of his observations, the author considers that this necrosis in leaf roll diseased potatoes is only an exaggeration of the normal degeneration of the sieve tubes, accompanied by defensive reactions on the part of the neighbouring cells. In opposition to other workers, he believes that the necrosis does not start from the cell walls and then spread to the cell contents, but that the cytoplasm is affected first.

Böning (K.). **Beobachtungen aus der Praxis über die wechselnde Ausprägung der Merkmale der Mosaik-krankheit der Kartoffel im Verlaufe der Vegetationszeit.** [Practical observations on the varying prominence of the characters of Potato mosaic in the course of the growing period.]—*Prakt. Blätter für Pflanzenbau und Pflanzenschutz*, v, 12, pp. 308–315, 1 fig., 1928.

The information supplied by a number of Bavarian local agricultural bodies regarding the varying degree of prominence of the symptoms of potato mosaic during the growing period discloses a very definite tendency towards the masking of such conspicuous characters as mottling and leaf curl at the close of vegetation. This is especially liable to occur in the eastern parts of the country and seed from apparently healthy stock in that region is very liable to develop mosaic symptoms in the less favourable environment of the west of Germany. In three cases the amount of infection, as judged by external symptoms, was reduced from 50, 50, and 11 per cent. at the first inspection to 33, 24, and 4 per cent., respectively, at the second. It is considered that the present German seed certification regulations, admitting 20 per cent. mosaic at the second inspection, are much too lenient and compare unfavourably with those obtaining in Holland and the United States [*R.A.M.*, vii, pp. 265, 527].

Botjes (J. G. O.). **Zwartbeenigheid van de Aardappelplant.** [Blackleg of the Potato plant.]—*Tijdschr. over Plantenziekten*, xxxiv, 3, pp. 91–105, 1928.

On the basis of his own researches and those of other workers [which are summarized], the author concludes that blackleg of potatoes [*Bacillus atrosepticus*] is transmitted by the seed, the infectious principle passing for generations from the tuber to the plant and vice versa [*R.A.M.*, vii, p. 261]. Tubers may also contract infection through lifting and cutting, and during storage. It is not known whether infection takes place through the soil, but some other source of contamination must exist in addition to the tubers, since the disease, which is most prevalent in cool, damp seasons, has been observed in individuals derived from healthy tubers of sound heredity. No instance of the transmission of blackleg from diseased to healthy plants occurred in the writer's experiments. The treatment of seed-tubers with corrosive sublimate exercised an adverse effect in some recent Dutch trials, the yield being reduced and the incidence of infection increased. The best means of control is the roguing out of diseased individuals (as late in the season as possible since infection may not appear before August), supplemented by the use of clean seed and storage in a dry, well-ventilated room.

Lindfors (T.). **Sortvalets betydelse för bekämpande av sjukdomar hos Potatis.** [The importance of varietal selection in the control of Potato diseases.]—*Landtmannen*, xi, 13, pp. 264–265, 1928.

Wart disease of potatoes [*Synchytrium endobioticum*] has not yet been recorded in Sweden [but see this *Review*, ii, p. 422], but in view of the possibility of its introduction, notwithstanding stringent legislative measures [ibid., vi, p. 575], the importance of cultivating immune varieties is urged. Practically every commercial variety grown at present in Sweden is susceptible to wart disease, e.g., Magnum Bonum, Up-to-Date, Wohltmann, Industrie, Silesia, Deodara, King Edward, Imperia, and Birgitta.

The potato disease of the greatest actual importance in Sweden, however, is late blight [*Phytophthora infestans*], which was particularly severe in 1927. A high degree of resistance was shown in the Stockholm district, by two Swedish varieties, Blända and Birgitta [ibid., iv, p. 694], as well as by the wart-resistant Pepo, Hindenburg, Beseler, Jubel, and Arran Consul. In Skåne [southwest Sweden], where the disease was particularly virulent, no variety was completely immune, but Beseler proved highly resistant, followed by Hindenburg and Arran Consul. Beseler and Blända, on account of their late development, are only suitable for cultivation in the south, while Jubel, Hindenburg, and Arran Consul should be planted in the Stockholm district and more northerly regions, and Birgitta should do well in Ångermanland [just south of lat. 64°]. Varieties showing only slight infection included Svalöv's Greta, Weibull's Imperia, Wohltmann, Bismarck, Parnassia, Deodara, Kerr's Pink, and Arnika, while the excellent

medium-late Majestic is immune from wart disease and relatively resistant to blight.

A comparative survey of the yield of 60 varieties in 1926 (when late blight was absent) and 1927 shows that the figures for the highly resistant varieties are approximately equal. On the other hand, the yield of the most susceptible varieties after the epidemic of 1927 was less than a third of the amount obtained in 1926.

The percentage of tubers unfit for use in 1927 was 41 in the most susceptible group, compared with 9 in the most resistant.

Severe damage is caused in the south-west of Sweden by leaf roll, to which Weibull's Imperia seems to be highly resistant [ibid., vi, p. 370].

A marked degree of resistance to scab [*Actinomyces scabies*] is possessed by Jubel and Hindenburg.

DUCOMET (V.) & FOËX (E.). **Essais effectués en 1927 au champ d'expériences établi par l'Institut des Recherches Agronomiques à Russ-Hersbach (Bas-Rhin) en vue de l'étude de la maladie verruqueuse (Synchytrium endobioticum Schilb. Perc.) de la Pomme de terre.** [Trials conducted in 1927 on the experimental field laid out by the Agricultural Research Institute at Russ-Hersbach (Lower Rhine) for the investigation of Potato wart (*Synchytrium endobioticum* Schilb. Perc.).] —*Comptes rendus Acad. d'Agric. de France*, xiv, 11, pp. 442–445, 1928.

The first symptoms of infection by wart disease (*Synchytrium endobioticum*) appeared on the potatoes planted in the Russ-Hersbach experimental field on 15th June, i. e., about six weeks after planting. On the whole, aerial galls were much less frequent than in 1926 [*R.A.M.*, vi, p. 180]. Twenty-six varieties which were not attacked in the previous year (including Arnika, Arran Comrade, Green Mountain, Hindenburg, Irish Cobbler, Parnassia, Pepo, and Preussen), maintained their immunity during 1927, while a further 23 (including Arran Consul, Great Scot, Spaulding Rose, Ceres, Thiele's Früheste, Jubel, and Tannenberg) proved immune in their first test. Thirty-seven varieties which were susceptible in 1926 were attacked to a varying extent during the 1927 trials. Triumph, which was slightly susceptible in 1926, remained healthy in 1927, while Splendo, immune in 1926, was slightly attacked in the recent tests. In general, these results agree with those obtained in other countries; the Lieuwe variety, however, which is reputed to be resistant in Holland, was slightly attacked at Russ.

The data obtained from a study of the different sources of contamination show that infection was transmitted (1) through the soil to a depth of 50 cm.; (2) through the soil of a field carrying infected crops for two years previous to the trials; (3) through the sweepings from a cellar used for the storage of infected tubers, even after disinfection with lime; (4) through the refuse of a village situated in the midst of the infected zone; (5) through the soil of a meadow irrigated with water from the infected zone; and (6) through the soil adhering to turnips dug from a field infected in the previous year. Negative results, on the other hand, were given by tests of the transmission of infection through the air.

Of the various preparations tested for the destruction of the organism in the soil, only formalin (1 to 1·5 l. in 18·5 l. of water, applied at the rate of 20 l. per sq. m.) proved fairly efficacious.

Of the wild and cultivated Solanaceae grown in infected soil, bitter-sweet [*Solanum dulcamara*] and four varieties of tomato (Groseille, Cerise, Poire, and Reine des Hâtives) contracted wart disease. The Mikado, Grosse lisse, and Abondance tomato varieties remained immune.

Goss (R. W.). **Varietal susceptibility of Potatoes to Fusarium wilt and stem-end rot.**—*Phytopath.*, xviii, 3, pp. 307–309, 1928.

Considerable differences have been observed during the last seven years in varietal reaction to *Fusarium* wilt and stem-end rot of potatoes (*F. eumartii*) in Nebraska [*R.A.M.*, iv, p. 114]. The results of greenhouse and field experiments conducted in 1926 and 1927 indicate that both Irish Cobbler and Early Ohio are much more susceptible to this disease—one of the most serious in western Nebraska—than Bliss Triumph. In 1926 there was some decrease in infection as a result of treating the cut seed-pieces with a 1 in 10 semesan bel solution, but in 1927 the same treatment slightly aggravated the amount of disease. This suggests that infection commonly occurs through the roots in Nebraska.

Verhoeven (W. B. L.). **Overgang van ringvuur (Verticillium albo-atrum) bij Aardappelen met de knollen.** [Transmission of Potato wilt (*Verticillium albo-atrum*) by the tubers.]—*Tijdschr. over Plantenziekten*, xxxiv, 3, pp. 106–108, 1928.

The tubers of 98 Eigenheimer potato plants suffering from wilt (*Verticillium albo-atrum*) [*R.A.M.*, vi, p. 636] in 1926 were planted on healthy soil and the progeny observed for symptoms of infection in 1927. The results of this experiment [presented in tabular form] show that over 30 per cent. of the progeny contracted the disease, which in this case was evidently transmitted by the tubers.

Reiling. **Kringelsucht der Kartoffel.** [Sprain of Potatoes.]—*Illus. Landw. Zeit.*, xlviii, 9, p. 121, 4 figs., 1928.

This is a brief, popular note on the disease of potato tubers known in Holland as 'kringerigheid' [sprain: *R.A.M.*, v, 572], which was particularly prevalent in 1925 and 1927 in the Lüneburger Heide district (province of Hanover), and appears to be generally spreading in Germany. The most susceptible varieties appear to be Eigenheimer and Odenwälder Blaue. The effects of sprain in stored potatoes are not usually so severe as those of brown rot (*Phytophthora infestans*), but under certain conditions the culinary value of diseased tubers may be considerably impaired.

Rubber Research Scheme (Ceylon).—*Sixth Rept. Exec. Ctte, Proc. during the year 1927*, 39 pp., 1928.

In the reports furnished (pp. 8–10, 16–18, and 19) by the Organizing Secretary (Mr. J. Mitchell), the Physiological Botanist (Mr.

R. A. Taylor), and the Mycologist (Mr. R. K. S. Murray), various references are given to the prevalence and control of different diseases of *Hevea* rubber in Ceylon during 1927. The chief item of interest is the statement that an increased number of estates have reported outbreaks of *Oidium* leaf fall [*O. heveae*: *R.A.M.*, vii, p. 267]. The application of nitrogenous manures is believed to be a more promising method of control for this disease than spraying.

BOBILIOFF (W.). **Kenmerken voor de identificatie van meeldauw.** [Characters for the identification of mildew.]—*Arch. voor Rubbercult. Nederl.-Indië,* xii, 3, pp. 199–206, 2 col. pl., 1928. [English summary.]

In connexion with the increasing prevalence of mildew [*Oidium heveae*] on the rubber estates of West Java [*R.A.M.*, vii, p. 267], some characters are described to assist in the recognition of the disease, which is very liable to confusion with the attack of mites [*Tarsonemus translucens*]. Besides causing abnormal shedding of young leaves, the under surface of which is chiefly infected, especially in the neighbourhood of the veins, the fungus may also infect half- or fully-grown foliage, producing yellow or brown spots on the upper surface with little defoliation. Even after the heavy rains of the west monsoon, numerous hyphae of *O. heveae* are found on and round the brown lesions, while conidia seldom occur. It seems probable, therefore, that the fungus overwinters in the mycelial stage and infects the young leaves by means of conidia produced on the old spots. Sometimes the first infection occurs on the petioles.

SCHAFFNIT (E.) & VOLK (A.). **Beiträge zur Kenntnis der Morphologie und Physiologie verschieden ernährter Pflanzen.** [Contributions to the knowledge of the morphology and physiology of differently nourished plants.]—*Landw. Jahrb.*, lxvii, 3, pp. 305–329, 16 figs., 1928.

In this paper the writers describe and discuss the anatomical, physiological, and morphological modifications induced in 32 species of plants belonging to 12 different families by the application to the soil of varying quantities of nitrogen, potash, and phosphoric acid, as well as the pathological changes induced by a deficiency in each of these nutrients. The data relating to the influence of the nutrition of the host on parasitic diseases have already been presented [*R.A.M.*, vi, p. 570].

WAKSMAN (S. A.), TENNEY (FLORENCE G.), & STEVENS (K. R.). **The rôle of micro-organisms in the transformation of organic matter in forest soils.**—*Ecology*, ix, 2, pp. 126–144, 1928.

After reviewing the work of previous investigators on microbiological processes in forest soils, the authors present a series of data bearing on the formation and decomposition of organic matter from the various constituents of leaves and other plant parts reaching the soil [cf. *R.A.M.*, vii, p. 472].

A detailed discussion of the methods of analysis of natural organic materials is given elsewhere (*Soil Sci.*, xxiv, p. 317, 1927). It was found possible by these means (with certain necessary modi-

fications) to compare the composition of the organic matter of forest soils with that of fresh undecomposed plant products, and to make an accurate estimate of the nature of the former.

The so-called 'forest humus' was found to consist of (1) a number of the residual constituents, such as the celluloses, hemicelluloses, fats, waxes, &c., of the various plant products (leaves, twigs, roots, mosses, and the like), which are undergoing decomposition; (2) the constituents of the plant products more or less resistant to decomposition, such as the lignins, cutins, tannins, resins, and so forth; (3) the microbial cells (fungus mycelium, spores, bacterial cells, &c.), synthesized in the process of decomposition of the natural organic materials continuously added to the soil; and (4) the decomposition products of the natural materials and cell products, e. g., organic and inorganic acids, ammonia, and the like. It was found that the microbiological flora of the aerobic preparations examined consisted predominantly of fungi. Leaves are rapidly decomposed under aerobic conditions, the water-soluble constituents, hemicelluloses, celluloses, and proteins quickly disappearing. The lignins are the most resistant, and two-thirds of the humus formed consist of lignins and proteins. Under anaerobic conditions the decomposition processes are considerably slower.

The use of alkalis and other reagents for the determination of the various 'humic' and other so-called acids in the organic matter of forest soils is considered quite unjustifiable. Even the use of the term 'humus' is questioned, since it does not represent, either chemically or biologically, any uniform substance or group of substances.

SALMON (E. S.) & WARE (W. M.). **The downy mildew of the Hop in 1927.**—*Journ. Min. Agric.*, xxxiv, 12, pp. 1093–1099, 1928.

This article gives a brief account of the hop downy mildew [*Pseudoperonospora humuli*] situation in England in 1927. The subject is more fully dealt with by the same authors in a paper already noticed from another source [*R.A.M.*, vii, p. 196].

WORMALD (H.). **The parasitism of the Hop leaf-spot fungus Cercospora cantuariensis.**—*Trans. Brit. Mycol. Soc.*, xiii, 1–2, pp. 32–39, 1 pl., 1 fig., 1928.

Details are given of inoculation experiments made with pure cultures of *Cercospora cantuariensis* [*R.A.M.*, iii, p. 61; vi, p. 692] which have conclusively shown that, as suggested in previous papers, the fungus is the primary cause of the leaf spot disease of hops recorded in 1922 in Canterbury. The cultural characters of the fungus on various media are also described.

MAUBLANC (A.) & BARAT (H.). **Une maladie nouvelle de la Vanille.** [A new disease of Vanilla.]—*Agron. Colon.*, xvii, 123, pp. 77–82, 1928.

In diseased vanilla pods sent from Réunion the authors observed an abundant mycelium resembling that of the Peronosporaceae, and

hyaline, granular, broadly oval conidia, borne terminally on erect hyphae which were sometimes in tufts, and measuring 30 to 50 by 25 to 33 μ; these were usually rounded at the base, and bore an obtuse papilla at the apex. More seldom they were lemon-shaped and papillate at both extremities (the basal papilla being the point of insertion on the stalk). Numerous round chlamydospores were also observed within the diseased tissues, measuring 26 to 40 μ (average 35 μ) in diameter. These were hyaline to light brown, and had a granular content and a rather thin membrane.

From these characters the authors consider that the fungus belongs to the *Phytophthora omnivora* group [*R.A.M.*, v, p. 5]; the shape and dimensions of the conidia bring it near to *P. faberi*, and the presence of the chlamydospores even nearer to *P. jatrophae*. As *Jatropha curcas* is frequently grown with vanilla in Réunion, the authors think that the vanilla fungus may be identical with *P. jatrophae*. Cultural studies, however, could not be made, as the material was received preserved in formalin.

The disease was first observed causing serious damage in 1926, but is thought to have been present previously. It is characterized by a rotting of the vines and also of the pods. The *Phytophthora* was only observed on the latter, on which it caused a brown rot commencing from the base and extending over the whole fruit. Affected pods fall before they are ripe.

Control by improved cultivation is recommended.

WOOD (E. J. F.). **Cane diseases in Queensland in 1927.**—*Queensland Agric. Journ.*, xxix, 3, pp. 182–198, 1 diag., 1928.

In this paper the author expands the information contained in his earlier reports [*R.A.M.*, vii, pp. 345, 400] and gives full notes on the symptoms, distribution, and control of the chief diseases of sugar-cane observed in Queensland during 1927.

Mosaic, gumming (*Bacterium vascularum*), leaf scald [*Bact.* sp.], and Fiji disease [*Northiella sacchari*] are widely distributed, but their severity varies greatly in different districts. Leaf stripe [*Sclerospora sacchari*] is restricted to a few farms, save in the vicinity of the Mossman, Burdekin, and Houghton rivers, where infection is general and serious. Red rot (*Colletotrichum falcatum*) is generally mild, but can become very severe when soil conditions are poor and the weather favourable to it. Top rot [ibid., ii, p. 581; vi, p. 54] is prevalent in a few places, chiefly affecting Badila canes. Spindle top or pink sclerotial disease [ibid., vii, p. 345] has caused heavy damage in the Innisfail district of Queensland, especially on red soil in Upper Darradgee, in Babinda, and along the Mulgrave River. Banded sclerotial disease [*Sclerotium* sp.], iliau [*Gnomonia iliau*], peg leg or foot rot [ibid., v, p. 632; vi, p. 508], *Marasmius* root disease [ibid., iv, p. 568], brown rot [ibid., v, p. 385; vi, p. 53], and X-disease are all of minor importance. The last-mentioned disease was very prevalent at Childers in 1927. Affected canes are elongated and chlorotic and occur in patches on old farms, known to be deficient in potash and phosphate. It is thought that the trouble may be due to this deficiency, and control by fertilizing is being attempted.

Ciferri (R.). **Preliminary observations on Sugar Cane mycorrhizae and their relationship to root diseases.**—*Phytopath.*, xviii, 3, pp. 249–261, 1928.

Both healthy and diseased sugar-cane rootlets may be invaded in the Dominican Republic by a Phycomycetous endophyte and a *Rhizoctonia*, or by the latter alone, while a *Pythium*, probably different from the endophyte [*R.A.M.*, vii, p. 474], may be found associated with them. The endophyte cannot be cultured artificially, and therefore its systematic position must for the present remain uncertain. Two strains of the *Rhizoctonia*, A and B, were isolated. The former strain (which developed in 14 out of 16 isolations) may at first stimulate the growth of the plants, but after several months of infection, or under unfavourable conditions for the canes, it assumes a parasitic character. The behaviour of the Phycomycetous endophyte when alone is unknown. The *Pythium* appears to be uniformly parasitic.

The premature death of the rootlets is considered to be undoubtedly related to endophytic action, the development of root diseases resulting from the loss of equilibrium between the dying rootlets and the new ones in course of formation. Hence the outbreak of root diseases is assisted by any cause tending to hinder the rapid production of new roots, e. g., excessive moisture, severe drought, a high degree of soil acidity or alkalinity, defective methods of cultivation, special physical or chemical composition of soils, and the like.

Experiments in the partial sterilization of the soil by copper sulphate and sodium arsenate have so far given inconclusive results, and apart from improved cultural measures, no means of control hitherto tested shows any great promise of success against this type of root disease.

Ashby (S. F.). **The oospores of Phytophthora nicotianae Br. de Haan, with notes on the taxonomy of P. parasitica Dastur.**—*Trans. Brit. Mycol. Soc.*, xiii, 1–2, pp. 86–95, 6 figs., 1928.

The author describes the oospores which he observed in pure and mixed cultures of strains of *Phytophthora nicotianae* isolated from tobacco in the Dutch East Indies, Florida, and Trinidad, and which in every case were definitely amphigynous. Similar oospores developed in cultures of a morphologically indistinguishable fungus isolated from a cotton boll affected with boll rot in Trinidad, and they also developed in cultures of a strain isolated from *Pollia* in Sumatra when grown in mixed culture with *P. parasitica*. More recently a morphologically similar fungus has been received from Malaya, isolated from a case of bark rot of *Hevea* rubber, but oospores have not yet developed in this strain. These strains, all of which except the last formed large oospores, are stated to be practically indistinguishable in the characters of the mycelium, sporangia, and chlamydospores in cultures on standard media such as bean-meal, quaker oats, and corn-meal agars, from strains of *P. parasitica*, with the only difference that in some forms of the latter species the oospores are smaller. Since the size of the oospores alone does not appear to be a sound criterion on which

to base a difference of species, the more so as the sexual spores are often produced with difficulty in cultures and have not been found on the hosts, it is proposed to eliminate *P. nicotianae* and to merge all the strains into *P. parasitica*, broadening the conception of this species to cover the group with large oospores. It may be, however, convenient to distinguish the two groups by employing the term 'microspora' for that with oospores of a mean diameter of under 20 μ, and 'macrospora' for the group with oospores having a mean diameter exceeding 20 μ (25 to 30 μ in the known strains). The former group would include the forms previously referred to *P. parasitica* Dastur and *P. terrestris* Sherbakoff, as well as Sawada's *P. melongenae* and *P. allii*; while the macrospora group would include the tobacco and other strains referred to above, and Godfrey's *P. parasitica* var. *rhei*. A description is given of the species *P. parasitica* thus emended, and also of the characters distinguishing it in pure cultures from the other four tropical and sub-tropical species which possess large papillate sporangia and sexual spores of the amphigynous type, namely, *P. palmivora*, *P. colocasiae*, *P. meadii*, and *P. arecae*. The two last-named species are stated to be so closely allied that further comparative study may show them to be identical. Leonian's inclusion of the majority of these species and strains in *P. omnivora* [*R.A.M.*, v, p. 45] is not accepted, the author stating that *P. parasitica*, *P. palmivora*, and *P. colocasiae* can be distinguished by stable morphological characters when cultivated on standard media.

SEAVER (J.). **Studies in tropical Ascomycetes. IV. Some Hypocreales from Trinidad.**—*Mycologia*, xx, 2, pp. 52–59, 5 pl., 1928.

Among the notes given in this paper on a number of Hypocreaceae collected in 1921 in Trinidad, the following are of particular interest. *Macbridella striispora* (Ellis & Ev.) Seaver was found in abundance on the bark of an undetermined tree. A careful morphological comparison of this fungus with a specimen of the ascigerous stage of *Sphaerostilbe musarum* Ashby leads the author to consider both species as identical, and since the latter had already been identified with *S. longiascus*, and Ellis's specific name has priority over the other two, he suggests maintaining the name *Macbridella striispora* with the following as synonyms: *Nectria striispora* Ellis & Ev., *Sphaerostilbe longiascus* Möller, and *S. musarum* Ashby.

Scoleconectria tetraspora was collected on nearly matured pods of cacao, and is thought to be in part responsible for their blighting. In the Herbarium of the New York Botanical Garden the author found a specimen identical with this fungus, listed by Massee from Grenada as *Calonectria flavida*, a name which is not tenable since it has already been applied to another species in North America.

WHETZEL (H. H.) & JACKSON (H. S.). **The rusts and smuts of Bermuda.**—*Trans. Brit. Mycol. Soc.*, xiii, 1–2, pp. 1–32, 1928.

The authors state that in preparing this list of the rusts and smuts of Bermuda they have, as far as possible, examined all the

specimens and accounts published of these fungi from Bermuda, and that they believe the list to be substantially complete and correct. It comprises nine species of smuts distributed in five genera, and 49 species of rusts in twelve genera. Of these species, six of the smuts and 24 rusts are reported for the first time from these islands. In addition to the usual taxonomic data and critical notes, brief notes have been included on the field aspect of each species as a guide to amateur collectors.

KERN (F. D.). **Fungi of Santo Domingo. II. Uredinales.**—*Mycologia*, xx, 2, pp. 60-82, 1928.

This paper, which is a continuation of Toro's first list of Dominican fungi [*R.A.M.*, vi, p. 322], gives a list of 86 species of rusts previously recorded or newly collected in the Dominican Republic (up to May, 1927), and comprises four new species, the English diagnoses of which are given. Synonymy is not dealt with, but frequent references are made to the North American Flora for fuller details. The paper terminates with a host index of the species listed.

HEDGCOCK (G. G.). **A key to the known aecial forms of Coleosporium occurring in the United States and a list of the host species.**—*Mycologia*, xx, 2, pp. 97–100, 1928.

In this paper a key is given for the determination of the aecidial forms of the genus *Coleosporium*, namely, the needle forms of *Peridermium*, which occur on pines in the United States. It is primarily intended for use with fresh specimens, but should also afford help in naming dry material. A list is appended of the natural hosts of the species named, and also of the species of pines which were artificially infected with them.

SMALL (W.). **On Rhizoctonia bataticola (Taub.) Butler as a cause of root disease in the tropics.**—*Trans. Brit. Mycol. Soc.*, xiii, 1–2, pp. 40–68, 2 pl., 1928.

In this paper the author gives an account of the recent work done by him and other investigators in the study of the incidence and distribution of *Rhizoctonia bataticola* (*Macrophomina phaseoli*) in Uganda and Ceylon, most of which has already been noticed in this *Review* [*R.A.M.*, vii, p. 407 *et passim*]. He states that, in his opinion, the rapidly widening knowledge of the distribution and host range of this fungus and the conditions of its occurrence may prove to have a significance beyond the two regions in which its parasitism on woody plants has been investigated, and that a thorough search for it throughout the tropics and sub-tropics, particularly in tea, citrus, cacao, and rubber-growing areas, would probably serve to extend still further its distribution and host range and lead to a full recognition of its suspected great economic importance.

In giving some morphological notes on the fungus, it is stated that the black lines or sclerotial plates formed by *R. bataticola* which have been described and figured in previous papers [ibid., iii, p. 748; v, p. 451] may occur in the bark as well as in the wood of a root, and that, when they do so, the part in the wood is con-

tinuous with the part in the bark and cortex. They are less wavy or reticulated than the lines formed by other fungi, and are usually black, although occasionally small portions of a line may be dark brown rather than black. The lines may occur alone or may be accompanied by sclerotia. They have no hyphae in connexion with or proceeding from them as distinct from the hyphae composing them, but, in islands formed by lines, a growth of hyphae into the island may take place and result in a blackening of the wood inside the island. In root wood the lines may invade starch-containing cells as well as fibres and tracheids. A line or sclerotial plate may either approximate in structure to that of a sclerotium or it may be composed of hyphae which are distinguishable from each other, and it is believed that the latter form passes into the sclerotial type by the filling up of the cell cavities with a dense growth which eventually becomes a sclerotium-like mass. A brief description is also given of the lines formed by *Ustulina zonata* and *Fomes lamaoensis*, to allow of a macroscopical and microscopical distinction between them and those of *R. bataticola*.

In terminating the author discusses the affinities of the fungus and gives an outline of the experiments now in progress to test its parasitism in comparison with that of certain other fungi reported to be responsible for root diseases of woody plants in the tropics.

Park (M.). **A preliminary note on a mycorrhizal fungus of Tea roots.**—*Trop. Agriculturist*, lxx, 3, pp. 171–174, 1928.

The author states that in his endeavours to isolate the common mycorrhizal fungus of tea roots, he consistently obtained only one organism, namely, a *Rhizoctonia* of the *R. bataticola* type. He therefore suggests the possibility that *R. bataticola* [*Macrophomina phaseoli*] may be normally present as a symbiotic endophyte in tea roots, but that in conditions unfavourable to the tea bush it may become an injurious parasite.

Naoumoff (N. A.). Сведения о работе над изучением заплесневения Табаков и установлению мер борьбы с ним, произведенной в Микологическом Отделении Исследовательской Лаборатории Ленинградского Государственного Табачного Треста. [Report on the study of Tobacco mouldiness and of the means for its control made at the Mycological Section of the Research Laboratory of the Leningrad State Tobacco Trust.]—*Исслед. Лабор. Ленинградск. Табачн. Треста* [*Res. Lab. Leningrad State Tobacco Trust*], *Bull.* 11, pp. 47–57, 1928.

This is a brief report of the results obtained at the Research Laboratory of the State Tobacco Trust in Leningrad from experiments to test the effect of various fungicides and of pasteurization on the development of moulds (*Penicillium glaucum*, *Rhizopus nigricans*, *Aspergillus glaucus*, and *A. fumigatus*) on cured tobacco leaves, smoking mixtures, and manufactured cigarettes. Contrary to expectations, formalin solutions at concentrations varying from 1 in 600 to 2·5 per cent., applied for various periods up to 6 hours, did not inhibit but only retarded the development of the moulds, and adversely affected the taste and colour of the tobacco. Other fungicides tested, such as carbon disulphide, salicylic acid, phenol,

furfural, and the like, also had but a slightly retarding effect on the appearance of the moulds in cigarettes. A 4 per cent. solution of thymol in toluol gave apparently positive results, as no mould developed on the cigarettes after the lapse of 45 days from treatment, but this treatment cannot be recommended as the cigarettes still had a strong smell of toluol at the end of six weeks. On the other hand, very promising results were obtained by swabbing the petioles of the cured leaves with a 2 per cent. formalin solution.

Pasteurization of the tobacco in a moisture-saturated atmosphere gave results detrimental to the quality of the tobacco, and 30 minutes' treatment by dry heat at a temperature of 70° C. gave no measure of control.

Blood (H. L.). **A 'streak' of Tomatoes produced by a disturbing principle from apparently healthy Potatoes in combination with Tomato mosaic virus.**—*Phytopath.*, xviii, 3, p. 311, 1928.

A severe mosaic disease of commercial tomatoes in Utah has been identified as streak [*R.A.M.*, vii, p. 479], and evidence has been obtained that apparently healthy potatoes of certain standard varieties carry some disturbing principle which, in combination with the tomato mosaic virus, can produce the symptoms of streak. Juices from apparently entirely normal Green Mountain, Early Ohio, and Irish Cobbler potato plants were inoculated into healthy tomato plants (simultaneously inoculated with tomato mosaic virus), which developed severe streak symptoms indistinguishable from those produced on tomatoes by inoculation with the combined tomato mosaic and potato mosaic viruses.

Carne (W. M.). **Spotted wilt of Tomatoes.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., v, 1, p. 58, 1928.

Spotted wilt [*R.A.M.*, vii, p. 410] is stated to be the most serious disease of tomatoes in Western Australia, especially in the spring and early summer crops; in most parts of the State (except Geraldton, which is comparatively unaffected), as also in New South Wales, Victoria, and South Australia, it is in some years almost impossible to raise commercial spring-grown tomato crops in the open.

Parker (T.). **Glasshouse sanitation.**—*Fertiliser, Feeding Stuffs & Farm Supplies Journ.*, xiii, 5, pp. 138–139, 1928.

Encouraging results were given by preliminary trials at the Abol Research Laboratories, Kent, during 1926–7, of formaldehyde fumigation (5 fl. oz. per 1,000 cu. ft. for 24 hours at 60° to 70° F.) for the control of tomato mildew [leaf mould] (*Cladosporium fulvum*) [*R.A.M.*, vi, p. 700]. Further experiments with this method on a larger scale have been planned.

Graves (A. H.). **Forest pathology.**—*Seventeenth Ann. Rept. Brooklyn Bot. Gard., 1927* (*Brooklyn Bot. Gard. Record*, xvii, 2), pp. 49–52, 1928.

Further investigations were conducted to determine the reason for the high degree of resistance to blight (*Endothia parasitica*) of

the root of the American chestnut (*Castanea dentata*) as compared with the stem [*R.A.M.*, v, p. 457]. The results of a series of laboratory and field inoculation experiments [which are briefly described] indicate that this resistance is not due to the higher tannic acid content of the roots; to the fact that the roots are normally covered with soil and therefore less accessible to air than the stems; to the greater quantity of moisture in the roots; or to the formation of some special cicatricial tissue. It would appear, therefore, that the resistance to blight shown by the roots is essentially protoplasmic and inherent, though it may possibly be influenced to some extent by one or more of the above-mentioned factors.

SCHMITZ (H.) & JACKSON (L. W. R.). **Heartrot of Aspen, with special reference to forest management in Minnesota.**—*Minnesota Agric. Exper. Stat. Tech. Bull.* 50, 43 pp., 10 graphs, 1927. [Received June, 1928.]

After a brief reference to the economic importance of the aspen (*Populus tremuloides*) in Minnesota, the authors give a detailed description of the investigation, carried out for the most part on statistical lines, of the incidence of heart rot of the trees in that State, and of the damage caused by it. All the evidence collected tended to show that most of the decay is caused by *Fomes igniarius*, which is common throughout the whole range of the aspen and whose fruiting bodies were almost always found in large numbers. In two cases fruiting bodies of *Armillaria mellea* were found. Some of the decay may also be due to *Fomes applanatus* [*Ganoderma applanatum*], although no fruiting bodies of this fungus were actually seen in the areas surveyed.

For practical purposes three stages of decay are distinguished, namely: incipient, intermediate, and final rot, of which the last two are economically the most important, since aspen wood affected with incipient decay alone is not likely to be culled by any of the industries using it. The results of the study indicated that in 70-year-old stands the intermediate and final stages of decay involve 20·5 per cent., in 60-year-old stands 15·7 per cent., in 50-year-old stands 11·4 per cent., in 40-year-old stands 7·8 per cent., and in 30-year-old stands 4·8 per cent. of the marketable timber volume, while if only the final stage is considered, these reductions fall to 9·1, 4·6, 2·4, 1·3, and 0·7 per cent., respectively. The indications were also that the mean annual growth of well-stocked aspen stands on average soils attains its highest economic point in about 40 years when the calculations include the total amount of intermediate and final decay present in them, and in about 50 years when the final rot alone is considered. This appears to indicate, under extensive management and with adequate protection from fire, a 40- to 50-year pathological rotation of the stands under average Minnesota conditions.

Branch scars are considered to be probably the most important avenues of entrance for wood-destroying fungi, but fire scars and insect injuries are undoubtedly contributing sources. There was no evidence that suckers are infected by the parent stump through the roots, and this is further supported by the fact that heart rot

was seldom found to extend to any appreciable distance into the roots. Isolations made on the spot from decayed aspen wood showed that a fungus may usually be obtained from the final stage. Bacteria were commonly yielded from the intermediate stage, while 85·5 per cent. of the cultures made from wood showing incipient decay remained sterile. Fungal mycelia were found in abundance in the black rings characteristic of the final stages of decay, but they were rarely found very far outside the rings, and were always absent from the microscopic sections of wood in the initial stage of rot.

ELIASON (E. J.). **Comparative virulence of certain strains of Pythium in direct inoculation of conifers.**—*Phytopath.*, xviii, 4, pp. 361–367, 1928.

The results [presented in tabular form] of a series of experiments to test the parasitism of certain strains of *Pythium* and other fungi on conifer seedlings showed that all but three caused damping-off in some of the species used.

Aphanomyces euteiches, the causal organism of pea root rot [*R.A.M.*, vii, p. 354] caused damping-off and root rot in *Pinus banksiana*, *Picea engelmanni*, and *Pseudotsuga taxifolia*, the last-named being attacked also by *Pythium de Baryanum*, *P. aphanidermatum*, *P.* sp., *Fusarium moniliforme* [*Gibberella moniliformis*], and *Corticium vagum* [*C. solani*]. *P. banksiana* and *P. strobus* were infected by *C. solani* and various strains allied to *P. de Baryanum*, the former being also attacked by *G. moniliformis*. Four strains of *Pythium* of the *P. de Baryanum* type infected *Pinus resinosa*.

WILSON (M.). **Successional disease in the Scots Pine.**—*Trans. Brit. Mycol. Soc.*, xiii, 1–2, pp. 81–85, 1928.

Details are given of a succession of diseases from which a seven-year-old Scots pine tree [*Pinus sylvestris*] was found to suffer at Roxburgh in Scotland, namely, a root and collar rot caused by *Fomes annosus*, bark injury caused by the beetle *Pityogenes bidentatus*, and a blueing of the wood caused by *Ceratostomella pini*. The origin of the diseases is attributed to the initial bad planting of the tree, and their succession is suggested as follows. The presence of injured or dead roots at the time of planting favoured the establishment of *F. annosus*, which, by killing some of the roots, lowered the water content of the tree and thus rendered possible the attack of *P. bidentatus*, and the latter, in its turn, brought about the infection of the wood with *C. pini*.

McCUBBIN (W. A.). **White Pines and the blister rust.**—*Pennsylvania Dept. of Agric. Gen. Bull.* 457, 10 pp., 1 fig., 3 maps, 1928.

In 1927 white pine blister rust [*Cronartium ribicola*: *R.A.M.*, vii, p. 349] was found on currants and gooseberries in at least 42 counties of Pennsylvania, extending as far south as the Maryland border and as far west as Butler County, although in previous years the few infections known in the State were confined to four or five north-eastern counties near areas outside the State where the disease has long been severe [ibid., vi, p. 65].

As pines infected from *Ribes* in 1927 will not bear spores until about 1930, the spread of the disease will be checked if all *Ribes* are removed from within 300 yards (the range of the dissemination of infection from *Ribes* to pine) of pine areas. *Ribes* may still be infected by spores carried in the air over long distances, since the spores produced on pines are capable of infecting at a great distance, but this is not likely to be of frequent occurrence. It is not intended to undertake the destruction of all currants and gooseberries in the State, as there are not many pine areas in Pennsylvania, and those that it would pay to protect are few. In New York and New England one-fourth of the pine areas have been protected by the systematic removal of the alternate hosts.

Canada Department of Agriculture Destructive Insect and Pest Act Advisory Board. Regulations under the Destructive Insect and Pest Act P.C. 559.—Regulation No 17 (Foreign). —1 p., 1928.

As from 12th April, 1928, the importation from all European countries into the Dominion of Canada of all species and varieties of *Ulmus* is prohibited in order to prevent the introduction of Dutch elm disease [*R.A.M.*, vii, p. 289].

Legislative and administrative measures. Brazil.—*Internat. Rev. of Agric.*, N.S., xix, 4, p. 402, 1928.

By a Decree of 27th December, 1927 (Diario Oficial, lxvii, 10, p. 859, 12th January, 1928), a special credit has been opened at the (Brazilian) Ministry of Agriculture, Industry, and Commerce of $500,000 for extraordinary expenses incurred in the control of sugar-cane mosaic throughout the country.

Legislative and administrative measures. Indochina.—*Internat. Rev. of Agric.*, N.S., xix, 4, pp. 403–404, 1928.

By virtue of a Decree of the Minister of the Colonies, dated 17th January, 1928 (*Journ. officiel de la République Française*, lx, 21 and 25, pp. 1089, 1342, 25th and 29th January, 1928), the importation into Indo-China of plants, soil, and composts liable to cause the introduction or spread of insect pests or fungous diseases may only take place through the port of Saïgon. The conditions governing their entry are to be determined by Decree of the Governor General in each case. This measure also applies to the cases, sacks, and wrappings used in the transport of these plants, soil, and composts. The Ministerial Decrees of various dates relating to rubber, coco-nut, sugar-cane, and coffee are suspended, and all enactments contrary to the present Decree repealed.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

APPLIED MYCOLOGY

Vol. VII OCTOBER 1928

De Koning (M.). **Zieke Douglasdennen.** [Diseased Douglas Firs.]—*Tijdschr. over Plantenziekten*, xxxiv, 3, pp. 109–110, 1928.

Douglas firs [*Pseudotsuga taxifolia*] in Holland have been found to be liable to infection by *Trametes radiciperda* [*Fomes annosus*], and can therefore no longer be used to replace other conifers destroyed by this fungus. In 1923 De Hoogh found *Dermatea eucrita* [*R.A.M.*, vii, p. 552] causing a stem canker of *P. taxifolia* in various parts of Holland, while in England the occurrence of *Rhabdocline pseudotsugae* on the same host has been recently reported [ibid., vii, p. 482].

Chupp (C.). **Club root in relation to soil alkalinity.**—*Phytopath.*, xviii, 3, pp. 301–306, 1 graph, 1928.

Experiments were undertaken to determine the amount of hydrated lime necessary to adjust the hydrogen-ion concentration of the soil to a point inhibiting the growth of *Plasmodiophora brassicae* on cabbage [*R.A.M.*, vii, p. 299]. In order to obviate the risk of error from the fluctuations occurring in field and green-house soils, it was found essential to conduct numerous tests in which the determinations of P_H values were made at frequent intervals, and then to plot a curve from all the averages thus procured. Seven plots were staked off in the field with buffer plots at each end. The second and fifth plots were left untreated as controls, and the rest treated as follows: (1) 1,000 lb. hydrated lime per acre; (3) 2,000 lb. lime per acre; (4) 640 lb. sulphur per acre; (6) 3,000 lb. lime per acre; (7) 320 lb. sulphur per acre. During each planting some 1,600 cabbages were grown in each plot.

The watery pulp exuded by ground clubbed roots was scattered along the furrow in which the seeds were dropped. Two crops were grown on each plot and the P_H values were determined first by the colorimetric method, and later by the more accurate potentiometer.

The results of the experiment [which are tabulated] show that little effect on the incidence of club-root was obtained by applica-

tions of 1,000 and 2,000 lb. lime to the acre on soil with an original P_H only slightly above 5·0. However, when 3,000 lb. were applied two months before planting and the P_H value of the soil thereby adjusted to slightly over 7·0, the amount of infection was reduced from between 93 and 94 to about 3·2 per cent. Similar results were obtained with six successive crops grown in 22 jars in the greenhouse. The upper limit for infection was found to be P_H 7·2 to 7·4, while at or even somewhat above P_H 6, 100 per cent. club-root is possible. Sulphur used at the above-mentioned rates injured the plants and failed to control club-root.

It was found that the addition of lime in quantities sufficient to inhibit infection by *P. brassicae* did not kill the latter, infection recurring when the soil eventually became acid through the repeated growth of cabbage in it.

CLAYTON (E. E.). **Black-leg disease of Brussels Sprouts, Cabbage, and Cauliflower.**—*New York (Geneva) Agric. Exper. Stat. Bull.* 550, 27 pp., 8 pl., 1927. [Received June, 1928.]

After a brief description of the symptoms caused by blackleg (*Phoma lingam*) on Brussels sprouts, cabbage, and cauliflower (a disease which is stated to have been first recorded on Long Island in 1903 and to have become in recent years very destructive there), the author gives some details of experiments conducted from 1922 to 1927 for the purpose of evolving practical and effective measures for its control [*R.A.M.*, vi, p. 387]. The results indicated that the plants usually become infected in the seed-bed, and that infection in the field, after transplantation of the seedlings, hardly ever occurs and when it does is of no economic importance. The source of infection resides either in the seed or in the soil. It was shown that locally produced seed of Brussels sprouts and cabbage is very commonly infected with *P. lingam*, and that the viability of this fungus persists practically as long as that of the seed, while soil infected with it remains infective for at least three years. Seed-borne infection and infection carried by seed-bed soil can be separated by the fact that the former is usually largely confined in the field to the plants from a particular lot of seed, while the latter attacks with about equal severity all lots of cabbage, cauliflower, or sprouts transplanted from the same bed.

Of all the seed disinfection methods tested, the best results were obtained by treating the seed for 25 minutes in hot water at 122° F. (50° C.) [ibid., iv, p. 459], and a description is given of an apparatus devised for so treating the seed on a large scale. Coupled with five to six years crop rotation in the seed-beds, and three years crop rotation in the field, this treatment has resulted in an almost entire control of the disease in areas where it had previously been very destructive.

Tests of a large number of cabbage and cauliflower varieties and strains have shown that all are almost equally susceptible to the disease. A strain of Brussels sprouts has, however, been discovered which exhibits partial resistance. Selections have been made from this strain, and some of them showed promise when tested in the field in 1926.

JONES (L. K.). **Studies of the nature and control of blight, leaf and pod spot, and foot-rot of Peas caused by species of Ascochyta.**—*New York (Geneva) Agric. Exper. Stat. Bull.* 547, 46 pp., 7 pl. (3 col.), 4 graphs, 1927. [Received June, 1928.]

The results of the author's investigations from 1924 to 1926 [details of which are given] lead him to consider, in agreement with Linford and Sprague [*R.A.M.*, vii, p. 1], that the diseased condition of peas formerly known as *Ascochyta* blight or leaf and pod spot is caused by the parasitism of three different organisms, and he therefore suggests the following nomenclature for the diseases: (*a*) *Ascochyta* leaf and pod spot, caused by *A. pisi*: (*b*) *Mycosphaerella* blight, caused by *M. pinodes*, to the hitherto unnamed pycnidial stage of which he gives the name *Ascochyta pinodes* (Berk. and Blox.) n. comb.; and (*c*) *Ascochyta* foot rot caused by *A. pinodella* n. sp., which is stated to be Linford's and Sprague's suspected 'micro' form of *M. pinodes*. English diagnoses of the newly named species are given.

The three organisms differ both in the symptoms caused by them on peas and in their cultural characters [a brief description of which is given], the differences being more marked between *A. pisi* and either of the other two fungi than between the latter alone. No marked variations in cultural characteristics or spore measurements were noted in strains of *A. pisi* originating from various parts of North America and from England, and cultures of *M. pinodes* and *A. pinodella* isolated from peas of various origin in North America showed the strains of each species to be similar. The measurements of the pycnospores of *A. pisi* and *M. pinodes* differ from those reported by Linford and Sprague in that they show that these two organisms cannot be separated on the basis of mean length of the spores. Their pycnospores, however, are distinctly larger than those of *A. pinodella.* An ascigerous stage was found in culture and on the host in *M. pinodes*, but not in the other two species. Another marked difference between the organisms was the duration of the incubation period necessary to produce macroscopic lesions on the hosts. The indefinite, light green, sunken lesions caused by *A. pisi* appeared on the leaves in six to eight days after inoculation and became tan coloured with definite brown margins two or three days later. The small purplish-brown spots caused by *M. pinodes* and *A. pinodella* appeared on the leaves in two to four days and slowly developed into the typical larger lesions, the rate of development depending upon the prevailing moisture and temperature conditions.

All the evidence collected by the author tended to show that, of the three diseases, the *Mycosphaerella* blight is the most destructive and that it is probably responsible for the greater part of the losses caused by serious outbreaks. All the three organisms may live over winter in pea refuse in the field and spread to new plantings in the spring; the pycnospores produced by them are not disseminated freely for long distances, but appear to be spread by water splashing and possibly by insects. The development of the diseases on the aerial parts of the plants is dependent upon periods of high humidity during the growing season. *A. pinodella* appears to be able to live in the soil for at least two years.

Laboratory tests of a large number of pea seed samples during three years showed that the three species of *Ascochyta* are often carried in the seed; it was found, however, that the seed produced in the semi-arid western part of the United States was practically always free from fungous infection, while a high percentage of the seed produced in eastern North America was more or less infected. For this reason it would seem advisable for seed analysts to include in their pea seed germination reports, data on the percentage of seed per sample infected with fungi, especially with species of *Ascochyta*. In seed from England only *A. pisi* was found.

Comparative tests under greenhouse and field conditions showed that seed infected with fungi usually gave a lower percentage stand than healthy seed. The treatment of infected pea seed with organic mercury dusts in general increased the percentage stand of plants; the amount of this increase was variable, being greater in seed of low vitality and when the seed was sown under soil conditions of high humidity and low temperature. The organic mercury dusts did not, however, control the spread of primary infection with *A. pisi* from diseased seed to the aerial parts of the plants. Preliminary experiments tended to show that the dusting of seed infected with *M. pinodes* or *A. pinodella* considerably reduced foot rot injury.

On the ground of his observations the author considers that measures for the control of these diseases should consist of the use of healthy seed, crop rotation, and the destruction of pea refuse in the fields. Since recent investigations have thrown some uncertainty on the recorded host range of *A pisi*, further investigations are desirable to determine the exact host range of the three organisms in relation to the introduction and spread of the diseases in pea plantings.

Although none of the varieties of peas tested proved to be immune from infection by any of the three organisms, some were found to be much more resistant to injury than others, and it is believed that the use of the less susceptible varieties where practicable, as well as the development of new varieties from them, may considerably reduce the losses from these diseases.

REDDICK (D.). **Building up resistance to diseases in Beans.**—*Cornell Agric. Exper. Stat. Memoir* 114, 15 pp., 1928.

This is a summarized report on the author's work, extending over a period of seven years, in the attempt to breed a commercially acceptable variety of bean (*Phaseolus vulgaris*) resistant to anthracnose (*Colletotrichum lindemuthianum*) [*R.A.M.*, v, p. 645] and to mosaic. By crossing the White Imperial variety, which is practically immune from the α and β strains of *C. lindemuthianum* [ibid., iii, p. 110], and the Robust variety, immune from the γ strain of this fungus and from mosaic, he obtained a number of selections which were subjected for several years to very severe tests for resistance to these diseases both in the greenhouse and in the field, and which proved to be entirely immune from them; some of these selections exhibited characters which may render them acceptable to the trade. It is pointed out, however, that these selections have not been tested for their resistance to other strains of *C. linde-*

muthianum, the existence of which has been demonstrated by Leach [ibid., iii, p. 109] and Muller [ibid., v, p. 645]. A short list is also given of other varieties of beans which may be used in breeding experiments for resistance to diseases.

SHEVTCHENKO (V.). Нова хвороба Цукрового Буряка для України, **Rhizoctonia violacea Tul.** [A disease of Sugar-beet, *Rhizoctonia violacea* Tul., new to the Ukraine.]—*Селекційний Вісник* [*Plant-Breeding Messenger*] *1928*, Belaya Tzerkov, 4, pp. 21–23, 2 figs., 1928. [German summary.]

The discovery in 1925 and 1926, in two districts within the area served by the Belaya Tzerkov Plant Protection Station, of red rot of sugar beet caused by *Rhizoctonia violacea* [*R. crocorum*] is stated to be the first official record of the disease in the Ukraine. The condition of the beet roots examined indicated that the disease is already well established in the localities in question, and the necessity is therefore stressed of taking measures for its control, a short description of which is given. A very brief description is also given of the morphology of the fungus and of the damage caused by it.

GREISSING (J.), SEĆKAŘ (F.), & POLLAK (A.). **Ein Bekämpfungsversuch der Cercospora beticola in der Suranyer Zuckerfabrikswirtschaft im Jahre 1927.** [An experiment on the control of *Cercospora beticola* in the Surany Sugar factory industrial areas in the year 1927.]—*Zeitschr. für Zuckerind.*, lii, 29, pp. 325–327, 1928.

Excellent results in the control of leaf spot of sugar beet (*Cercospora beticola*), which is stated to cause very heavy damage in Czecho-Slovakia, Hungary, Rumania, Jugo-Slavia, and Italy, were obtained at Surany (Czecho-Slovakia) in 1927 by four applications of 1 per cent. Bordeaux mixture given on 14th June, 4th and 30th July, and 27th August. The sugar yield of the treated plants was 16·24 q. per hect. higher than that of the controls, and the net gain from the spraying operations, after the deduction of all expenses, was estimated at 1009·60 kronen per hect.

STEWART (G.) & PITTMAN (D. W.). **Predisposition of Sugar-Beets to late rootrot.**—*Phytopath.*, xviii, 3, pp. 263–276, 3 figs., 1928.

Sugar beets in the Rocky Mountain region have suffered severely of recent years from epidemics of curly top [*R.A.M.*, vii, p. 295] and of the late root rot associated with *Phoma betae* and *Fusarium* spp. The latter disease caused extremely heavy damage in 1924 and 1926, when the average yields in the Cache Valley were only 7 and 9 tons per acre, respectively, compared with a normal production of 12 tons per acre. The results [which are tabulated] of a survey of plots at the Utah Experiment Station, grouped into classes of high, intermediate, and low productivity according to their yields in normal years, showed no differences in the degree of injury from curly top. There were, however, permanent and outstanding differences in the degree of injury from root rot on the plots of the various categories, heavy damage occurring on those of low

productivity in both the epidemic seasons, while little or no infection was observed on plots of high productivity. Good soil treatment (including the use of farm manure), reasonable crop rotation, and the maintenance of proper soil moisture conditions should give complete control of this type of root rot.

MERCURI (S.). **Prove preliminari di terapia del marciume radicale del Carciofo.** [Preliminary tests in the control of root rot of Artichoke.]—*Boll. R. Staz. Pat. Veg.*, N.S., viii, 1, pp. 86–93, 1928.

In field experiments conducted during October and November, 1927, in the vicinity of Rome, two- to three-year-old artichokes [*Cynara scolymus*] affected with the root rot due to *Rosellinia necatrix* [*R.A.M.*, vii, p. 218] received the following soil treatments: 50 gm. copper sulphate crystals per plant, 50 gm. iron sulphate powder, 30 and 15 gm. calcium cyanamide dust, 1 l. 1 per cent. copper sulphate solution, 1 l. 2 per cent. iron sulphate, 1 l. 1 and 0·5 per cent. uspulun, germisan, and manganese sulphate, and 1 l. 0·5 and 0·25 sodium arsenite.

After two months (beyond which no further observations could be made) all the plants so treated (except those receiving sodium arsenite and the weaker manganese sulphate solution) were more vigorous than the untreated controls. The good effects of the 1 per cent. germisan were particularly noticeable, and the uspulun-treated plants, in contrast to the controls, showed no trace of the mycelium of *R. necatrix*.

Heavier or more concentrated applications of copper sulphate and sodium arsenite killed the plants, the latter solution causing scorching even at the concentrations given above. Manganese sulphate also produced slight scorching.

HENGL (F.). **Kalkgehalt der Spritzbrühe und Verbrennungserscheinungen an den Reben.** [Lime content of the spraying mixture and scorching of the Vines.]—*Allg. Weinzeit.*, xlv, 6, pp. 81–85, 1928.

The results of recent experiments [details of which are given] in Germany and Austria have shown that the use of strongly alkaline copper sulphate mixtures for the control of *Peronospora* [*Plasmopara viticola*] causes severe scorching of the leaves in several varieties of vine, e. g., Grauer Portugieser, Sylvaner, and Gutedel. Since 1926 sprays containing 1·4, 1·5, and 1·8 kg. quicklime for each kg. of copper sulphate in the Bordeaux mixture have been recommended in Austria, 100 to 150 gm. urania green being added to control insect pests. On the basis of Gessner's experiments (reported in *Weinbau u. Kellerwirtsch.*, 3, p. 18, 1928), the Sub-Committee for Pest Control of the German Viticultural Association has recommended the use of 1·2 kg. lime (or 1·5 kg. when 150 to 200 gm. Schweinfurt green is added as an insecticide) for the preparation of the 1 per cent. Bordeaux mixture.

CADORET (A.). **La bouillie bleue Cadoret.** [Cadoret's blue mixture.]—*Prog. Agric. et Vitic.*, lxxxix, 12, pp. 281–283, 1928.

In this article, the author again asserts his confidence in the

value of Bordeaux mixture for the control of vine mildew [*Plasmopara viticola*] when prepared according to his formula [*R.A.M.*, iii, p. 187], i. e., when containing at least 2·5 per cent. each of copper sulphate and lime.

Directions are given for the preparation of the mixture, together with a spray calendar [loc. cit.].

VILLEDIEU (G.). **Bouillies et poudres.** [Mixtures and powders.] —*Prog. Agric. et Vitic.*, lxxxix, 12, pp. 283–286, 1928.

After referring to the conflicting results obtained in the control of vine mildew [*Plasmopara viticola*] from the use of copper sulphate mixtures [*R.A.M.*, vii, p. 489], and the inconvenience entailed in handling large quantities of water, the author recommends a more extensive adoption of copper sulphate dusts [ibid., vii, p. 74]. In 1927, vines in the vicinity of Tours which received dust treatments were not injured by mildew, but those given liquid treatments alone lost part of their crop from this cause.

OSTERWALDER (A.). **Von der Gelbsucht der Rebe.** [On chlorosis of the Vine.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxvii, 7, pp. 105–113, 1928.

An account is given of the condition known as chlorosis of the vine, which sometimes occurs in Switzerland as a secondary consequence of *Peronospora* [*Plasmopara viticola*] epidemics [*R.A.M.*, vii, p. 75], but may also result from an excess of lime in the soil or from defective aeration. Good results in the control of the disease have been obtained by the application to the soil, during April and May, of 10 per cent. copper sulphate (6 l. per vine stock), by fertilization with superphosphate and potash, and by improved drainage. In Germany the application of anthracite coal slag to the soil (strewn between the vine rows) is stated to have proved satisfactory in the amelioration of defective soil conditions.

WORMALD (H.). **Plant pathology.**—*Ann. Rept. East Malling Res. Stat. 1st January, 1927, to 31st December, 1927*, pp. 53–56, 1928.

In addition to items already noticed from other sources, the following are of interest. A comparison of the species of *Verticillium* causing blue stripe wilt of raspberry with those isolated from other plants indicates a close relationship with *V. dahliae* [*R.A.M.*, vi, p. 740]. It has been shown by experiments and observations on seedling raspberries grown in rich and poor types of soil that infection with the blue stripe organism does not necessarily cause a weakening or killing of the canes, such injury being dependent on highly specialized external conditions (soil, temperature, moisture, and the like).

Further evidence was obtained that raspberry mosaic is transmissible to healthy stools by grafting in the Baumforth Seedling B variety [ibid., vi, p. 597].

The artificial inoculation of raspberry canes (*a*) with a pure culture of a fungus isolated from discoloured patches of bark on young canes, and (*b*) with a culture obtained from a single ascospore of *Didymella applanata*, gave positive and identical results,

indicating that the common discoloration of young canes, associated with spur blight, is an early stage of infection by the last-named organism [ibid., vi, p. 739].

The results of cultural and inoculation experiments carried out during 1926–7 indicate that spring rainfall is an important factor in the development of infection by the organisms found associated with bacterial shoot wilt of plum and leaf spot and gummosis of cherry trees [ibid., vi, pp. 143, 597]. The symptoms of both these diseases can be induced by inoculation with bacteria isolated from stem cankers and from leaf spots. A bacterial organism has also been isolated from a peach tree showing symptoms of die-back.

Evidence of the parasitic nature of the *Verticillium* associated with hop wilt [ibid., vi, p. 579] has now been secured. The fungus is stated to agree closely in morphological and cultural characters with *V. albo-atrum.*

[Nattrass (R. M.).] **Economic mycology.**—*Ann. Rept. Agric. & Hort. Res. Stat., Long Ashton, Bristol, for 1927*, pp. 202–212, [1928].

During 1927, apple mildew [*Podosphaera leucotricha*: *R.A.M.*, vi, p. 528] was again very serious in the Bristol province.

Leaf spot of black currants (*Pseudopeziza ribis*) [ibid., v, p. 678] almost completely defoliated many acres of the Baldwin variety, but Davidson's Eight and Edina were markedly resistant; hard pruned bushes of Baldwins showed considerable resistance to the disease.

Plums attacked by *Fusicladium carpophilum* [*F. cerasi*] were received from Worcestershire, where the fruit had been attacked for three years previously.

Raspberries at Long Ashton were seriously damaged by powdery mildew (*Sphaerotheca humuli*), Northumberland Thornless Fillbasket and Baumforth E being badly attacked, Reader's Perfection and Semper Fidelis B rather less so, while Baumforth B, Lloyd George, Red Cross, Goliath, Hornet D, and Maclaren's Prolific were only slightly affected.

A leaf spot of walnut trees caused by a species of *Marssonina* with larger conidia (28 μ long) than those of *M. juglandis* was observed at Long Ashton, and a bacterial die-back of the same host in Herefordshire.

In addition to the willow diseases previously recorded [ibid. vi, p. 529] rusts (*Melampsora* spp.) were reported from Somerset and scab (*F. saliciperdum*) was observed at Long Ashton; *Diaporthe spina* Fuck. occurred on diseased rods but its parasitism was not ascertained.

Zaprometoff (N. G.). Работа фитопатологического Отдела Узбекистанской Опытной Станции Защиты Растений в **1926** году. Отчет за **1926** год. [Work done in 1926 by the Phytopathological Section of the Uzbekistan Plant Protection Experimental Station. Report for 1926.]—*La Défense des Plantes*, Leningrad, v, 1, pp. 75–79, 1928.

In this report of the Uzbekistan Plant Protection Station brief notes are given on the chief diseases of economic crops in Central

Asia; those dealing with cotton diseases have already been noticed from another source [*R.A.M.*, vii, p. 374]. In experiments in the control of the *Cercospora* diseases of the vine [*C. vitiphylla*, *C. vitis*, and *C. roesleri*; ibid., v, p. 207; vi, p. 124], the best results were obtained by spraying the vines with a mixture of polysulphide and sulphate of zinc (56 gm. sulphate of zinc, 73 gm. liquid polysulphide, 1 tablespoonful of granulated sugar to 1 vedro [12·3 l.] water), the protective action of the spray lasting about one week. Next in efficacy was a spray consisting of 29 zolotniks [1 zolotnik = 4·266 gm.] copper sulphate, 5 zolotniks iron sulphate, and 29 zolotniks unslaked lime to 1 vedro water. Spraying the bunches of grapes attacked by *Oidium* [*Uncinula necator*] with a solution of 5 or 6 gm. permanganate of potash in 1 vedro of water, with the addition of 2 tablespoonfuls of sugar, proved very effective in stopping the development of the disease and in preventing attacks of secondary organisms on the burst grapes, but had the drawback of affording a very transient protection, thus entailing numerous repetitions of the treatment. In general, soda gave more reliable results in the treatment of *Oidium* [cf. ibid., vii, p. 255].

The following diseases are stated to have been recorded for the first time in 1926 in the region of Tashkent: *Oospora verticillioides* on maize; *Bacterium mori* on the mulberry [*R.A.M.*, vii, p. 550]; powdery mildew of the eggplant (*Oidium melongenae* or *Erysiphe communis*); powdery mildew of flax (*Oidium lini* Bond.); rust of *Phaseolus mungo* (*Uromyces appendiculatus*); and loose smut of rye (*Ustilago vavilovi*). In the same year perithecia of the powdery mildew of apple, *Podosphaera leucotricha*, were found for the first time on the petioles of apple leaves near Tashkent.

ROTHERS (B. V.). Отчет о фитопатологической работе Северо-Двинской Стазра за **1925–1927** годы. [Report on the phytopathological work of the North-Dvina Plant Protection Station from 1925 to 1927.]—*La Défense des Plantes*, Leningrad, v, 1, pp. 80–90, 1928.

A brief account is given of the work done from 1925 to 1927 by the North-Dvina Plant Protection Station which was created in 1923 and the activity of which extends over the whole area of the newly delimited North-Dvina government in the north of Russia. All the fungal diseases dealt with are of common occurrence.

WEBER (J. C.). Краткий обзор деятельности Самарской Станции Защиты Растений за **1926** и **1927** годы. [A brief review of the work done by the Samara Plant Protection Station in 1926 and 1927.]—*La Défense des Plantes*, Leningrad, v, 1, pp. 68–74, 1928.

This report deals mainly with rodents and insects injurious to economic crops, and the only item of mycological interest is the statement that very appreciable losses are caused every year by cereal smuts in the government of Samara [east Russia], where the total acreage under cereals is about 1,500,000 hect. Of these smuts the most important is the loose smut of wheat [*Ustilago tritici*], which appears to be more or less endemic, as its incidence and severity are fairly constant. The occurrence of wheat bunt

(*Tilletia tritici*), oat smut (*U. avenae*), and millet smut (*U. panici-miliacei*), on the other hand, varies greatly from year to year, the peasants saying that it is much heavier in wet than in dry years. It is also stated that wheat bunt is much more abundant in the north than in the south of the government. The prevalence of these diseases is in a large measure attributed to the neglect of the local growers to disinfect their seed-grain, and the necessity is emphasized of a campaign to popularize seed treatments among the population.

Smarods (J.). **Materialus Latvijas mikologiskai florai.** [Materials towards the knowledge of the mycological flora of Latvia.]—*Rept. Latvian Inst. Plant Protect. 1926–27*, pp. 16–25, 2 figs., 1927. [English summary. Received August, 1928.]

Among the numerous records contained in this annotated list of the mycological flora of Latvia the following may be mentioned. During the period under review, rye was severely attacked by *Fusarium nivale* [*Calonectria graminicola*] and to a slighter extent by *Puccinia graminis*. *Rhizoctonia violacea* [*R. crocorum*] was reported on beets and *Cladosporium fulvum* on tomato, both for the first time. Gooseberries were heavily infected by *Puccinia ribes-caricis*.

Work connected with insect and fungus pests and their control. —*Rept. Agric. Dept., St. Vincent, for the year 1927*, pp. 6–9, 1928.

Sclerotium rolfsii [*R.A.M.*, vii, p. 139] was exceptionally prevalent in cotton fields in St. Vincent early in 1927, and at the end of the season West Indian mildew (*Ovulariopsis gossypii*) was also common. The crop was also much reduced by soft rot (*Phytophthora* sp.) [ibid., vi, p. 80] against which the beneficial effect of late planting was demonstrated on four experimental plots, where the number of bolls destroyed on the plot planted in August was only 8·1 per cent. as compared with 64·4, 55·9, and 61·7 per cent., respectively, on three plots planted in July.

Hopkins (J. C. F.). **Report of the Mycologist for the year 1927.** —*Rept. of the Secretary, Dept. of Agric., Southern Rhodesia, for the year 1927*, pp. 43–44, 1928.

This report, covering a period of eight months, contains, *inter alia*, the following items of interest. The principal diseases affecting the tobacco crop were white mould (*Oidium* sp.) [*Erysiphe cichoracearum*: *R.A.M.*, vii, p. 203], which appeared early in the season and spread rapidly owing to the copious spore production induced by the dry conditions; angular spot (*Bacterium angulatum*), wildfire (*Bact. tabacum*), frog eye (*Cercospora nicotianae*), and mosaic. Original infection by wildfire was uniformly traceable to the seed-beds, and investigations are in progress to test the efficacy of the present system of seed sterilization.

An orange disease appearing at intervals on citrus estates has been investigated at Mazoe. It is known as 'pit marking' owing to the presence of small brown markings in the pits of the rind, which in severe cases coalesce, producing a bronzing of the surface.

usually at the blossom end, and spoiling the fruit for export. The condition is now known to be due to physiological causes, probably connected with the dry weather conditions, and irrigation experiments will be carried out during 1928. No correlation has been found between the incidence of pit marking and the presence or absence of any soil constituent in the fertilizer trial plots.

Bitter rot of apples [*Glomerella cingulata*] was very prevalent but may be controlled by the application of Bordeaux mixture.

A fungus which appears to be identical with the *Rhizoctonia* stage of *Macrophomina phaseoli* has been isolated from the roots of dead *Eucalyptus* sp. [ibid., vii, p. 408], and it is possible that this organism is responsible for the frequent death of Rhodesian gum trees.

Plant pathology.—*Rept. Director Utah Agric. Exper. Stat. for the 18-month period from January 1, 1925, to June 30, 1926*, pp. 56–62, 1926. [Received June, 1928.]

Excellent results in the elimination of rugose mosaic and leaf roll of potato were obtained during the period under review by the tuber-index method.

Fusarium wilt of tomatoes [*F. lycopersici*] constitutes a serious problem in Utah, where a field survey showed 7·87 per cent. of the plants to be diseased, with 80 per cent. of the crop destroyed in one plantation at Syracuse. The disease was present in 68 per cent. of the fields examined in 1924. Further work on the selection of resistant varieties was carried out. The popular commercial varieties, Stone, Landreth, and Greater Baltimore again proved most susceptible, while Norton, Norduke, Marvel, and Columbia showed a high degree of resistance.

Western yellow blight of tomatoes [*R.A.M.*, vii, p. 478] was extremely severe and widespread, destroying up to 25 per cent. of the crop before the end of June. In 1924 the tomato crop was practically ruined by this disease.

Mosaic was present in every tomato field inspected, the average incidence of infection being 32 per cent. Four per cent. of the plants yielded few or no marketable tomatoes, while in a further 10 per cent. production was seriously impaired. The estimated average decrease in yield as a result of mosaic is 8 per cent. Successful cross-inoculation experiments were carried out (*a*) from potato and tomato to *Solanum nigrum*; and (*b*) from *Physalis*, to tomato and from tomato to *Physalis*, *S. nigrum*, and *S. villosum*. Four apparently distinct types of mosaic of varying degrees of severity were obtained on the Experimental Farm in Davis County. Three of these types have continued true in symptomology for three generations, and one has been successfully transferred to *Physalis*, *S. nigrum*, and *S. villosum*.

White spot of lucerne, closely connected with the application of irrigation water after drought, was prevalent and caused serious damage in the Cache Valley. Crown wart of lucerne (*Urophlyctis alfalfae*) was observed in 16 per cent. of the fields examined, while dry rot and crown disintegration was very prevalent. Severe attacks of leaf spot (*Pseudopeziza medicaginis*) and bacterial stem blight (*Pseudomonas* [*Bacterium*] *medicaginis*) were also recorded.

Yellow leaf blotch [*Pyrenopeziza medicaginis*] appeared for the first time as a limiting factor in the production of lucerne.

Peach leaf curl (*Exoascus* [*Taphrina*] *deformans*) occurred in a destructive form, this being the first record for Utah.

LINFORD (M. B.). **Plant diseases in Utah in 1927.**—*Plant Disease Reporter, Supplement* 59, pp. 65–117, 3 pl., 2 diags., 1928.

This report, based mainly on the data obtained in a field to field survey conducted from 15th June to 15th September, 1927, contains a number of interesting records of diseases new to, or little known in, Utah, as well as notes on various other phytopathological problems of outstanding importance.

A widespread outbreak of yellows, a new and highly destructive potato disease associated with the psyllid *Paratrioza cockerelli* [*R.A.M.*, vii, p. 463], was of paramount importance in 1927. The losses incurred as a result of this disease were of two types, one preventing the development of tubers of marketable size, and the other impairing the commercial value of the tubers by the production of excrescences or by the sprouting of the eyes with the formation either of leafy shoots or of stolons which in turn set small tubers. The early plantings in some garden crops, and sometimes also in the chief market crops, were most severely affected, but the disease spread progressively throughout the season as long as healthy plants remained in any locality. All varieties appeared to be susceptible and the symptoms developed with equal freedom in potatoes grown from seed of diverse origin.

Bacterial canker (*Aplanobacter michiganense*) [see below, p. 680] was the most destructive disease of tomatoes in Utah during 1927, especially among canning crops. It is highly probable that the causal organism is seed-borne, and field evidence during the period under review indicated that the seed stocks of the canning crops were badly infested. The use of clean seed and the prevention of seed-bed infection would appear to be the most promising means of control.

A leaf blight, apparently of bacterial origin, was found widely distributed among the northern Utah strawberry crops in 1927. It is characterized by small, angular, dark green, water soaked lesions, later assuming a reddish or brownish tinge on the upper surface. The lower surface of these lesions, which sometimes elongate along the larger veins, generally bear, when wet, a copious milky bacterial slime; when dry, a thin scale of exudate. The disease does not appear to be very destructive, but it is the most important strawberry affection observed in the survey.

The three diseases here described are illustrated by plates.

Report of the California Agricultural Experiment Station from July 1, 1926, to June 30, 1927.—110 pp., 1927. [Received August, 1928.]

The following references of phytopathological interest, in addition to those noticed from other sources, occur in this report. Cantaloupe plants were successfully inoculated in the greenhouse with conidia of powdery mildew (? *Erysiphe cichoracearum*)

[*R.A.M.*, vi, p. 716] from dahlia and casaba [? *Sicana odorifera*]. The mildew was also collected on goldenglow [*Rudbeckia laciniata* var. *hortensia*], sunflower, and various Cucurbitaceae.

A test of the effect of temperature on sulphur injury to cantaloupes was made under controlled conditions. Injury occurred on the more mature basal leaves within five days on plants held at 16° C. and above, while those kept at 11° or below showed no sign of damage. All plants held at 32·5° were killed at the end of eight days [cf. ibid., vi, p. 467].

A disease of rhubarb not previously reported in California caused considerable damage in 1926. A fungus closely resembling *Pythiacystis* [*Phytophthora*] was repeatedly isolated from the infected crowns and roots [cf. ibid., ii, p. 432].

A species of *Fusarium* was constantly isolated from young avocado trees showing definite bark lesions on the stem and root. Two types of avocado fruit rot are considered likely to increase in importance, viz., anthracnose (*Colletotrichum gloeosporioides*) [*Glomerella cingulata*: ibid., vi, p. 601] and a rot probably caused by *Dothiorella gregaria*, the agent of melaxuma of walnuts.

C. gloeosporioides and *Alternaria citri* were regularly isolated from severely spotted Valencia oranges, and inoculation of sound fruit with these organisms through skin punctures gave positive results.

Among the other diseases investigated during the period may be mentioned sour sap of fruit trees (apparently connected with bacterial infection) [ibid., iv, p. 20], diamond canker of prune trees, and red bulb of freesias.

Nirula (R. L.). **Saltations in bacteria.**—*Ann. of Botany*, xlii, 166, pp. 431–467, 1 pl., 1928.

In briefly reviewing the existing literature dealing with mutation or saltation in micro-organisms, the author accepts Brown's definition of this phenomenon, namely: 'Mutations are sudden changes which are neither the result of a process of gradual acclimatization or "education", nor of a mere sorting out of one strain from what was originally a mechanical mixture', and goes on to describe in detail his studies on the saltation of four strains of bacteria, which he cultured on various standard solid and liquid media [the composition of which is given] for a period of over eight months. The organisms employed were a strain separated as an impurity from a culture of a bacterium pathogenic to cabbage; a strain isolated from a diseased melon; and two strains (one yellow and the other white) isolated from stones. All the cultures were grown from single cells isolated by a modification of the Indian ink method devised by Burri [which is described], and all produced sectors which arose suddenly and apparently independently of the conditions of cultivation. The new races which thus appeared, and which may be considered as true saltants, were cultured from single cells on the same media as their parents under different environmental conditions, and all exhibited constant morphological, physiological, and serological characteristics under standardized conditions during the whole period in which they were kept under observation. No reversion occurred in the course of cultivation, and all attempts

to induce reversion gave negative results. The saltants were sufficiently differentiated from their parents to suggest the possibility of their being new species, but they were so similar in their physiological behaviour that they are regarded as strains within the same species.

The author considers that morphological and cultural characteristics of bacteria are less reliable for the differentiation of species than physiological, and that for the same reason no dependence can be placed upon slight variations in colony characters and in physiological phenomena which can be correlated with speed of reaction of the metabolic processes.

McCulloch (Lucia). **Bacterium maculicola (Mc C.) nom. emend. syn. Bacterium maculicolum.**—*Phytopath.*, xviii, 5, p. 460, 1928.

The termination *a* is the preferred spelling in the case of the organism responsible for a leaf spot of cauliflower, which was originally described in *U.S. Dept. of Agric., Bur. Plant Indus., Bull.* 225, 1911.

Osterwalder (A.). **Drei Krankheiten und ein Bacterium.** [Three diseases and one bacterium.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxvii, 10, pp. 176–180; 11, pp. 190–191, 3 figs., 1928.

This is a popular account of three diseases caused by *Bacterium tumefaciens*, namely, crown gall of raspberries, which is apparently on the increase in Switzerland; crown gall of apple and pear trees; and 'mauche' of the vine [*R.A.M.*, vii, p. 11].

Woloschinowa (B.). **Zur Frage der Bekämpfung des Wurzelkropfes der Obstbäume.** [On the question of the control of crown gall of fruit trees.]—*Zeitschr. für Garten- Wein- und Gemüsebau*, xii, pp. 514–519, 1927. (Russian). [Abs. in *Bot. Centralbl.*, N.F., xii, 11–12, p. 373, 1928.]

The best results in a preliminary series of experiments in the control of crown gall of fruit trees [*Bacterium tumefaciens*] conducted in the Government of Kharkoff were obtained by disinfection of the roots with 1 per cent. copper sulphate, 0·1 per cent. corrosive sublimate, or hydrochloric acid [concentration not stated]. Treatment of the roots with lime-sulphur proved ineffectual.

Kauffmann (F.). **Eine bactericide Wirkung menschlicher Seren gegen Tumefaciensbacillen.** [A bactericidal action of human sera on *tumefaciens* bacilli.]—*Zeitschr. für Krebsforsch.*, xxvi, 6, pp. 519–525, 1928.

Active human serum was found in the author's experiments [details of which are given] to exert a destructive effect on *Bacterium tumefaciens* [*R.A.M.*, vii, p. 366]. The sera of carcinomatous patients did not differ materially in this respect from those of normal persons and of patients suffering from any other diseases, though their action was, on the whole, somewhat stronger. The action depends on the thermolabile complement content of the serum, and is in no way connected with bacteriolysin, lysozyme, or

similar ferments: it evidently corresponds to the bacteriolytic action of normal human serum on a number of other bacteria. *Bact. tumefaciens*, however, was more affected in these tests than the cholera vibrios and gonococci, which were the most susceptible of the other species used.

Peltier (G. L.) & Thiel (A. F.). **Stem rust in Nebraska. Part I. General survey of sources. Part II. Identification of the physiologic forms of Puccinia graminis from various sources.** —*Nebraska Agric. Exper. Stat. Res. Bull.* 42, 40 pp., 2 figs., 11 diags., 1927.

Summarizing the data obtained in a four years' general survey of the primary sources of stem rust of cereals (*Puccinia graminis*) in Nebraska [*R.A.M.*, vi, p. 408], it may be concluded that the uredospores of the fungus do not overwinter in the State. During the period under review, pycnidia were first observed on barberries between 20th and 26th April, aecidia with mature spores between 6th and 10th May, and uredospores on grasses and grains near infected barberries between 20th and 25th May. As a rule, aecidia continue to develop on barberries till about the middle of June, fresh sori frequently appearing on the young leaves after a period of damp weather.

The first uredospores near rusted barberries generally occur on the grasses *Hordeum jubatum* and *Agropyron smithii*, as well as on wheat, rye, and barley. The freedom of oats from infection under these conditions leads to the conjecture that the *avenae* strain of the fungus is not prevalent on barberries in Nebraska.

The first uredospores on grains not directly traceable to local barberries have usually been found in northern Kansas during the last ten days in May, appearing in south-eastern Nebraska in the first week of June. The initial appearance of rust in the west of the State is appreciably later (12 to 15 days) than in the east, probably on account of the lower precipitation, relative humidity, and temperatures in the former region. No uredospores not directly traceable to local barberries have ever been found in northern Nebraska before their appearance in the south of the State. The interval between the occurrence of uredospores in south and north has been found to vary from year to year. From 1921 to 1924, the intervals were 15, 10, 13, and 8 days, respectively, while in 1925 and 1926 the periods elapsing were only 2 and 4 days, respectively.

The gradual reduction in the losses due to stem rust during the last six years is attributed partly to the gradual decrease in the number of remaining barberries, and in some degree to the dry weather conditions which were unfavourable to the development of the fungus.

Altogether 16 different physiological forms of *P. graminis* have been found in Nebraska, of which eight may be classed as uncommon. Six of the more common strains have been found in Kansas and further south, while two were collected near infected barberries in Nebraska. It may be assumed that some of these forms entered Nebraska directly as wind-blown uredospores from

these regions, or indirectly as progressive uredospore generations advancing from the south.

SCHÖLLER (A.). **Ein einfacher und billiger Trockenbeizapparat.** [A simple and economical dusting apparatus.]—*Deutsche Landw. Presse*, lv, 14, p. 208, 2 figs., 1928.

The writer briefly describes and illustrates the construction of a home-made cereal seed-grain dusting apparatus consisting of a small barrel arranged to rotate on its central axis. For thorough disinfection of the seed-grain the machine should be kept in motion for about five minutes, reckoning 40 to 50 revolutions per minute. The use of abavit B is specially recommended to avoid any inconvenience from the inhalation of the dust on emptying the apparatus. During the past autumn this machine was used for the disinfection of some 100 cwt. of wheat and rye seed-grain in Württemberg.

GARBOWSKI (L.) & LESZCZENKO (P.). **Wyniki trzyletnich prób z zaprawianiem Pszenicy przeciw śnieci cuchnącej, Tilletia tritici Wint.** [Results of three years' experiments in seed disinfection of Wheat for the control of bunt. *Tilletia tritici* Wint.]—*Prace Wydz. Chorob Roślin w Bydgoszczy Państw. Inst. Nauk. Gosp. Wiejsk.* [*Trans. Phytopath. Sect. State Inst. of Agric. Science in Bydgoszcz*], *1928*, 5, pp. 1–18, 1928. [French summary.]

A full discussion is given of the results obtained in the experimental plots of the Phytopathological Section in Bydgoszcz [Poland] in three years' tests (from 1925 to 1927) of a number of liquid and dust preparations for the control of wheat bunt (*Tilletia tritici*) by seed disinfection. The highest degree of control with heavily infected seed was obtained by steeping the latter for 15 minutes in a 0·1 per cent. formalin solution; the germinability of even somewhat immature seed was not unduly injured by this treatment. Almost equally good results were obtained by steeping the seed for 15 minutes in a 0·5 per cent. solution of a new proprietary fungicide, Siarczyn No. 27 Klawe (Tow. przemyslu chemiczno-farmaceutycznego D. Mag. Klawe S.A., No. 22/24, al. Karolkowa, Warsaw). Agfa, uspulun, germisan, tillantin [uspulun-universal], and higosan did not prove as effective as these with heavily infected seed, and can be recommended only when the contamination of the seed is slight. As regards dust fungicides, powdered freshly slaked lime at the rate of 2 to 4 per cent. by weight of the seed gave better results than copper carbonate or porzol; satisfactory control was also given by dusting the seed with copper acetate at the rate of 0·4 per cent. by weight of the seed.

NEUWEILER (E.). **Einfluss der Konzentration und Menge von Kupfervitriollösungen auf die Keimfähigkeit von Weizen.** [Influence of the concentration and quantity of copper sulphate solutions on the germinative capacity of Wheat.]—*Landw. Jahrb. der Schweiz*, xlii, 2, pp. 271–288, 1 graph, 1928.

The results [which are described and tabulated] of a series of experiments to determine the influence of the concentration and

quantity of the copper sulphate solutions used against bunt [*Tilletia tritici* and *T. levis*: *R.A.M.*, vii, p. 501] on the germination of wheat, showed that the injury to the seed-grain, manifested especially by a reduction of germinative energy, increases progressively with the strength of the solution from 0·01 to 1 per cent. Large quantities of the solution (2, 4, 8, and 16 times the usual amount) produced more severe damage than normal quantities used at the same strength. With long periods of immersion (24 hours) the detrimental influence of the concentrated solutions was proportionally more pronounced than that of the dilute ones.

Wheat seed-grain should be dried after treatment with copper sulphate in order to prevent reduction of germination, which may be considerable if sowing takes place immediately. On the other hand, drying for a protracted period (up to 28 days) resulted in practically no loss of germinative capacity.

The weight and volume increase of wheat seed-grain steeped in copper sulphate solution is less than that of seed steeped in water, the swelling capacity declining with a progressive rise in concentration from 0·01 to 5 per cent. The increase in volume is relatively greater than that in weight.

The rootlet of the seedling is most severely injured by the disinfectant, owing to the greater absorption of copper through the hilar system. The accumulation of copper in this region (neighbourhood of the micropyle), as well as in the scutellum and aleurone layer, may be readily detected by the exposure of the seed to the action of ammonia or potassium ferrocyanide.

The seed-grain absorbs copper from the 0·01 to 1 per cent. solutions, the relative absorption increasing with the dilution. In very dilute solutions the amount of copper absorbed from the sixteenfold quantity of solution was greater than that absorbed from the fourfold quantity. No corresponding difference was observed in the use of varying quantities of the stronger solution.

NATTRASS (R. M.). **Report on bunt prevention trials, 1927.**—*Ann. Rept. Agric. & Hort. Res. Stat., Long Ashton, Bristol, for 1927*, pp. 104–106, [1928].

Little Joss wheat seed artificially contaminated with bunt [*Tilletia tritici*] and treated with 40 per cent. solution of formaldehyde at the rate of 1 in 320, 2·5 per cent. copper sulphate solution, or copper carbonate powder, 2 oz. per bushel, was planted in three districts in Wiltshire, the trials being carried out under field conditions.

In the first area these treatments gave 0, 0·19, and 0·42 per cent. bunted heads, respectively, as compared with 18·11 per cent. in the untreated control; in the second area the figures were 0, 0, and 0·09 per cent., respectively, with 10 per cent. bunted heads in the control, while in the third area they were 0·76, 0·15, and 0·73 per cent., respectively, and 17 per cent. in the control.

Traitement à sec des semences de céréales. [Dry treatment of cereal seed-grain.]—*Comptes rendus Acad. d'Agric. de France*, xiv, 17, pp. 601–608, 1928.

This is a discussion on the relative merits of the liquid and dry

treatments in the control of wheat bunt [*Tilletia tritici* and *T. levis*: *R.A.M.*, vii, pp. 311, 312]. Details are given of a continuous dusting apparatus supplied by Tourneur frères, Coulommiers, Seine-et-Marne, which treats 6 to 8 quintals of seed-grain per hour. Dusting is stated to be less efficacious than immersion, and is therefore only suitable in cases of mild infection.

SCHADT (E.). **Schädlingsbekämpfungsversuche auf dem Gute Helmhof bei Gersthofen (Bayern).** [Pest control experiments on the Helmhof farm near Gersthofen (Bavaria).]—*Nachricht. über Schädlingsbekämpf.*, iii, 1, pp. 4–5, 1 fig., 1928.

Excellent results in the control of *Fusarium* disease of rye [*Calonectria graminicola*] and bunt of wheat [*Tilletia tritici* and *T. levis*] were obtained by immersion in uspulun universal and by dusting with tillantin. Both germination and yield were approximately doubled by the treatments.

PLAUT (M.). **Kritisches und Statistisches zu Beizmethoden, Beizmitteln und Auswinterung.** [Critical and statistical data on disinfection methods, disinfectants, and winter injury.]—*Pflanzenbau*, iv, 22, pp. 337–345, 3 figs., 2 diags., 1928.

In this paper the writer presents numerous statistical and other data relating to the various modern methods of seed-grain disinfection, supplemented by observations on different types of apparatus and on some of the standard fungicides, and by notes on the winter injury of rye due to *Fusarium* [*Calonectria graminicola*]. Much of the information given here has already been noticed in this *Review* from other sources.

BLUNCK (H.). **Die Fusskrankheiten des Getreides.** [The foot rots of cereals.]—*Illus. Landw. Zeit.*, xlviii, 17, pp. 223–225; 18, pp. 239–240, 5 figs., 1928.

This is a popular account of the symptoms and effects of the foot rots of cereals, with observations on the life-histories of the causal organisms and directions for control based on the current phytopathological literature. It is pointed out that the main damage to the German wheat crop is caused by *Ophiobolus herpotrichus* [*R.A.M.*, vii, pp. 86, 87], while *O. graminis* predominates in France [ibid., vi, p. 721]. Both *O. herpotrichus* and the rye strawbreaker (*Leptosphaeria herpotrichoides*) are commonly accompanied by *Fusarium* spp. [see next abstract]. The black discoloration of the ears associated with *Cladosporium herbarum* and *Macrophoma hennebergii* [*Septoria nodorum*] is stated to be only a secondary consequence of foot rot.

Schlechte Weizenbestände. [Poor Wheat stands.]—*Ernähr. der Pflanze*, xxiv, 9, pp. 145–146, 1928.

Writing in the *Landw. Wochenschr. Prov. Sachsen und Anhalt*, 30, p. 602, 1927, Dr. Berg attributes the extreme prevalence of foot rot of wheat during 1927 primarily to the warm, damp weather, which favoured the development of *Fusarium* [see preceding abstract], and indirectly to injudicious fertilizing. The incidence of the disease was observed to be highest in crops following clover,

vetches [*Vicia* spp.], summer barley, and sugar beets, owing to the disturbance of the metabolic equilibrium induced by the nitrogen-fixing and potash- and phosphoric acid-reducing activities of these crops. The excess of nitrogen left in the soil exerts a loosening effect on the wheat tissues and increases susceptibility to *Fusarium* and rusts [*Puccinia* spp.]. These consequences may be avoided, however, by the application of 4 cwt. of 40 per cent. potassium and 8 cwt. superphosphate per hect. Wheat following beets requires extremely heavy applications of all three nutrients—phosphoric acid, potash, and nitrogen—in order to counteract the excessive withdrawal of these substances from the soil by the latter crop.

In a subsequent number (33, p. 656) of the same journal, Garcke relates that, in his experience, the incidence of foot rot was highest in wheat crops following legumes and cereals (especially barley), while very little injury occurred after potatoes and beets. In one case he observed 40 per cent. infection after vetches, 20 per cent. after oats, a considerable amount following clover, and none following potatoes.

REED (G. M.). **The inheritance of resistance of Oat hybrids to loose and covered smut.**—*Ann. New York Acad. Sci.*, xxx, pp. 129–176, 1928.

Continuing his investigations on the inheritance of resistance of oat hybrids to loose and covered smuts (*Ustilago avenae* and *U. levis*) [*R.A.M.*, vii, p. 560], the writer studied the F_2 and F_3 generations of crosses between the resistant Black Mesdag and the susceptible Hull-less varieties.

The results [which are tabulated] may be summarized as follows. Of the 465 F_2 plants inoculated with *U. avenae*, 107 or 23 per cent. were infected. Forty (20·4 per cent.) of the 196 F_2 plants inoculated with *U. levis* contracted infection. Of the 590 F_3 families inoculated with each of the smuts, 541 gave a similar reaction to both, while the remainder manifested a differential behaviour. The F_2 data strongly suggest a single factor difference for resistance in these two varieties, and the experimental results with the F_3 generation are in relatively close correspondence with this interpretation.

The F_2 generation of a cross between the susceptible Silvermine and resistant Black Mesdag gave similar results, viz., 17·8 per cent. infection in the 95 plants inoculated with *U. avenae* and 16·8 per cent. in the 89 inoculated with *U. levis*.

In every case crosses between susceptible varieties (Canadian × Victor and Silvermine × Hull-less) were as susceptible in the F_2 generation as the original parents.

Crosses between Victor and Hull-less (susceptible to both smuts) and Early Gothland (susceptible to loose smut) were studied. All the 52 F_2 plants of Early Gothland × Victor inoculated with *U. avenae* reacted positively, while only 8 out of 44 (18·1 per cent.) inoculated with *U. levis* contracted infection. With the hybrid Early Gothland × Hull-less 93·4 per cent. of the F_2 plants inoculated with loose smut became infected, while positive results were obtained with 37 out of 94 plants (39·3 per cent.) inoculated with

covered smut. In the F_2 generation of crosses between Hull-less and Monarch (susceptible to covered smut only), 41 out of the 196 plants (20·9 per cent.) inoculated with *U. avenae* contracted infection, while positive results were secured with 95 of the 100 plants inoculated with *U. levis*.

In all the crosses involving varieties differing in their smut reaction, resistance was dominant and susceptibility recessive, and segregation in the F_2 generation appeared to occur on the basis of a single factor difference.

No obvious linkage has been observed between smut resistance and other characters in oats, and the recombination of resistance and various desirable qualities can apparently be successfully accomplished.

REICHERT (I.) & PERLBERGER (J.). **The blast disease of Citrus—a new Citrus disease in Palestine.**—Reprinted from *Palestine Citrograph*, i, 4, 11 pp., 5 figs., 1928.

On 15th March, 1928, the authors' attention was drawn to a citrus disease at Rishon-Lezion, near Jaffa, where it has probably been present for some time past. Since that date a number of other localities have been found to be involved. The symptoms are in general agreement with those of the condition known in California as blast [*Pseudomonas citriputeale*: *R.A.M.*, vii, p. 515] and in Italy as 'mal secco' [ibid., v, pp. 358, 359 *et passim*]. Brown to blackish, somewhat depressed lesions appear on the leaf petioles and rapidly extend to the leaf veins, the base of the petiole, and the portion of the twig surrounding the latter. Affected leaves show a characteristic withering and curling. Sometimes only the leaf blades are shed, the petioles remaining attached to the branch. Gum drops are exuded from the affected twigs. After the rainy season the damage is specially conspicuous owing to the rapid desiccation and dropping of the leaves. When the leaf buds are attacked they do not recover.

Bacteria were found in the diseased tissues and isolations yielded in almost all the cultures an organism which is thought to be the cause of the disease, but which has not yet been identified.

Infection was observed on sweet and sour lemon, orange, and sour orange trees. About 80 per cent. of the one-year-old sweet lemon trees were affected, compared with only 10 per cent. of the sour orange trees of the same age. Budded two-year-old sour orange trees were more severely infected than one-year-old trees of the same variety. Old orange and sour lemon trees were only slightly affected. Every effort should be made to prevent the spread of infection and to minimize the heavy losses incidental to the disease by suitable control measures, including protection of the nurseries from strong winds; regular inspections and destruction of all infected material; use of healthy stocks for grafting; and a thorough application to the nursery trees of 1 per cent. Bordeaux mixture, with the addition of 2 l. of milk or 50 gm. of casein per 100 l., directly after the first rain in November or December.

DE VRIES (E.). **Een nieuwe ziekte bij Djeroek-keprok.** [A new disease of Oranges.]—*Indische Culturen* (*Teysmannia*), xiii, 5, pp. 226–228, 4 figs., 1928.

Bark rot of citrus [*R.A.M.*, iii, p. 332] has recently been reported from Madoera (Java). The principal symptom is the exudation of white foam from the soft, rotted areas in the bark. An examination of this fermented liquid, which emits a characteristic acid odour, reveals the presence of numerous yeasts and fungi. The conditions governing the development of this disease in the Philippines suggest that the abnormal drought of 1925 and 1926 is probably responsible for its appearance in the Dutch East Indies, to which infection is thought to have spread via the Moluccas. The average age of the infected trees in Madoera is given as six years. The most promising method of combating bark rot is the development of resistant varieties, but so far no steps have been taken in this direction. The disease is most severe on tangerines and mandarins [*C. nobilis* var. *deliciosa*], and also occurs in a milder form on Satsuma oranges [*C. nobilis* var. *unshiu*] and *C. mitis*. Sweet oranges [*C. sinensis*] and pomelos [*C. decumana*] appear to be immune.

ORIAN (G.). **Le 'bitten leaf disease' du Cocotier.** [The 'bitten leaf disease' of the Coco-nut.]—*Rev. Agric. de l'Île Maurice, 1928*, 38, pp. 86–87, 1928.

Attention is drawn to the occasional occurrence in Mauritius of the so-called 'bitten leaf disease' of coco-nuts (*Thielaviopsis paradoxa*) described by S. F. Ashby from Jamaica [*Dept. of Agric. Leaflet*, 1917]. The pinnae of freshly opened leaves present a bitten or cut and blackened appearance. In many cases pale yellow, brown-edged spots develop on the furled pinnae; later these lesions elongate, converge, and turn black owing to the presence in the tissues of the spores of the fungus. Infection spreads rapidly through the pinnae, and in severe cases the heart leaves dry up. The fungus does not injure the cuticle and the epidermis may be readily removed, exposing the fibres. The treatment recommended in Jamaica consists in the excision of the diseased tissues and dressing the wounds with a mixture of copper sulphate, sodium chloride, and lime in equal parts.

SUNDARARAMAN (S.), KRISHNAN NAYAR (C.), & RAMAKRISHNAN (T. S.). **The stem-bleeding disease of Arecanut (Areca catechu) caused by Thielaviopsis paradoxa von Höhn.**—*Agric. Res. Inst., Pusa, Bull.* 169, 12 pp., 5 pl. (1 col.), 1928.

In August, 1925, areca palms (*Areca catechu*) of varying ages in the Malabar district [Madras] were found to be affected by a disease closely resembling the stem bleeding disease of coco-nuts. A dark brown liquid exuded from the fissures in the stem, the fibrous tissues disintegrated, and eventually hollows of varying depth developed along the diseased areas. In some cases the yield was greatly reduced.

Inoculation experiments with *Thielaviopsis paradoxa* isolated from infected areca palms gave positive results on wounded sugarcane, coco-nut, and pineapple, as well as on the original host, while

a strain of the fungus from sugar-cane infected wounded specimens of all the above-mentioned hosts in addition to *Rhapis* sp., date palm [*Phoenix dactylifera*], plantain, mango, and *Saccharum spontaneum*. The conidial dimensions of the strains of *T. paradoxa* isolated from areca palms were found to agree closely with those of the sugar-cane and coco-nut strains.

The diseased areca palms were successfully treated by the excision of the infected parts, scorching the wound, and the application of hot tar [*R.A.M.*, i, p. 280].

WALLACE (G. B.). **Diseases of Coffee.**—*Tanganyika Dept. of Agric. Leaflet* 1, 7 pp., 1928.

In this leaflet brief descriptions are given of the most widespread diseases of coffee observed in 1927 in Tanganyika Territory. The incidence and degree of severity of the leaf rust (*Hemileia*) [*vastatrix*] vary from year to year, and also from one plantation to another, mainly depending on the various combinations of environmental conditions, such as altitude, humidity, exposure, and vigour of the coffee bushes. At high elevations, where as a rule rainfall is heavy, less shade is required, but precautions are necessary to protect the plantations against strong winds. At lower elevations the chief requirements are sufficient shade and shelter, as undue exposure very considerably magnifies the exhausting effect of the disease on the leaves. In localities where the rainfall is slight, weeding and good cultivation of the soil are especially necessary. It is emphasized that biological and cultural measures are much more effective in combating heavy infections of rust than spraying.

In the regions surveyed brown blight [*Glomerella cingulata*] was found only occasionally acting as a primary parasite, and was never serious enough to require control measures. Brown eye spot [*Cercospora coffeicola*] is more particularly a disease of coffee seedlings, but occasionally it was also found on trees from one to four years old, without apparently causing them much injury.

The other diseases mentioned are sooty mould [? *Capnodium* sp.]; a die-back of *Coffea arabica* attributed to exhaustion of the bushes; a second type of die-back only observed on *C. robusta* and *C. bukobensis* in the Usambara Mountains, which is due to an association of a twig-boring beetle and the brown blight fungus; root rot caused by a species of *Rhizoctonia*; witches' brooms found in two plantations on Kent's variety of *C. arabica*, and believed to be due to the species of *R.* which causes root rot; and damping-off of seedlings [? *R. solani*: *R.A.M.*, v, p. 299].

ROSEN (H. R.). **A consideration of the pathogenicity of the Cotton wilt fungus, Fusarium vasinfectum.**—*Phytopath.*, xviii, 5, pp. 419–438, 4 figs., 1928.

Previous experiments having shown that the presence of nitrates in nutrient media causes the production by *Fusarium vasinfectum* of substances toxic to cotton [*R.A.M.*, vii, p. 95], a series of greenhouse tests was undertaken, the plants being grown in pure quartz sand and in sandy loam soil low in nutrients, and nitrates being added to some of the jars. The average temperature of the house was about 28° C.

In the presence of heavy infestations of the fungus, the jars receiving nitrate of soda (at the rate of 1,000 lb. per acre) showed complete inhibition of germination, while no such effect was observed in the two control series, viz., jars with nitrate but no wilt fungus, and those containing the organism but receiving no nitrate [cf. ibid., vii, p. 320].

Considerable difficulty has been experienced by most investigators in the production of typical wilt symptoms by artificial inoculation. This led to a study of the mode of penetration by the fungus and of early disease symptoms.

F. vasinfectum was shown to be primarily an agent of cortical decay in the roots and stem bases, its chief means of entrance being through wounds. It is frequently found producing a limited, more or less superficial rotting of the tissues round the natural wounds induced by extruded secondary roots, and it may also be responsible for the death of elongated feeding roots without penetrating deep enough to cause wilt. The results of field and greenhouse experiments [which are described] denote that *F. vasinfectum* is much more dependent for its toxic action on certain soil factors than are other species of *Fusarium*. Excessive moisture, unsuitable or unbalanced nutrients, and similar factors promoting succulence and the perpetuation of the juvenile stage are essential to the causation of wilt by *F. vasinfectum*. The development of infection is further facilitated by insect injuries and *Rhizoctonia* lesions which disorganize the tissues and arrest their normal development.

Most varieties of cotton were found to be resistant to wilt when grown under proper conditions, and it is concluded that the disease is largely preventable in America by the use of manure or a green manurial crop.

TATE (P.). **Notes on the genera Ectomyces and Termitaria, fungi parasitic on Termites.**—*Parasitology*, xx, i, pp. 77–78, 1928.

Since the publication of his description of *Ectomyces calotermi* on the termite *Calotermes samoanus* [*R.A.M.*, vi, p. 552], the writer has become acquainted with Thaxter's account of the genus *Termitaria* represented by *T. coronata* and *T. snyderi* [ibid., vii, p. 323]. The spore dimensions of *E. calotermi* agree fairly closely with those of *T. snyderi* (4 to 5·3 by 2 compared with 3·5 by 2 μ), and in other particulars also the organisms correspond sufficiently to justify their identification as one and the same fungus. Consequently, *E. calotermi* falls into synonymy with *T. snyderi*. Feytaud and Dieuzeide [loc. cit.] state that another species of *Termitaria, T. thaxteri*, was described by Reichensperger as an external parasite of *Eutermes* and *Cornitermes* in Africa and Central America.

I danni arrecati dal 'calcino'. Una statistica impressionante. [Losses caused by muscardine. Impressive figures.]—*L'Istria Agric.*, N.S., viii, 7, pp. 147–151, 1928.

During 1927, muscardine [*Beauveria bassiana*: *R.A.M.*, vii, p. 445] was reported from 1,125 communes in Lombardy, 445

communes in Piedmont, 247 in the province of Venice, and from numerous districts in south Italy. In 1926, the percentage losses in various parts of Lombardy ranged from 5 to 35 per cent., representing a total loss of 3,800,000 kg. of cocoons, while in the provinces of Alessandria and Cuneo the loss amounted to 860,000 kg.

The control measures recently advocated [loc. cit.] are recapitulated. If the disease appears in spite of these precautions, all dead and diseased silkworms, together with the leaves and paper that formed the beds, must be destroyed.

VERGE (J.). **Les aspergilloses des oiseaux.** [The aspergilloses of birds.]—*Rec. Méd. Vétér.*, ciii, pp. 521–528, 1927. [Abs. in *Bull. Inst. Pasteur*, xxvi, 10, p. 443, 1928.]

The most common fungous parasite of birds is stated to be *Aspergillus fumigatus* (with which *A. aviarius* is considered to be synonymous), causing broncho-pulmonary and other symptoms [cf. *R.A.M.*, vi, p. 96]. Natural infection probably occurs through the inhalation of spores: artificial inoculation is simple and almost invariably fatal. The transmission of infection to man is relatively frequent. Other parasites of birds include *A. lignieresi* (closely allied to *A. fumigatus*) in penguins; *A. flavus*, causing pseudotuberculosis of fowls; and *A. herbariorum*, producing a cutaneous affection of pigeons.

CAVARA (V.). **Le micosi oculari.** [Ocular mycoses.]—iv + 494 pp., 176 figs., Siena, Libreria Editrice Senese, 1928.

This third volume of the series of text-books on human mycoses under the general supervision of Prof. G. Pollacci has been prepared on similar lines to the foregoing [*R.A.M.*, vii, p. 323]. An account of ocular mycoses in general is followed by chapters on actinomycoses, mucormycoses, saccharomycoses, ringworms, mycoses caused by *Aspergillus* and *Penicillium* spp., sporotrichoses, rare mycoses due to Mucedineae (comprising oosporoses and moniliases), rare mycoses produced by Dematiaceae, and mycoses of undetermined origin.

LANGERON (M.). **Les prétendues mycoses de la rate.** [The so-called mycoses of the spleen.]—*Ann. de Parasitol. Humaine et Comp.*, vi, 2, pp. 211–220, 1928.

In submitting to a critical review the more recent literature on certain cases of splenomegaly, in which the theory was advanced of a mycotic origin of the disease, the author concludes that the observations and descriptions published do not as yet authorize the unreserved acceptance of this theory [*R.A.M.*, vii, p. 578 and following abstracts]. In his view the mycelial filaments and conidial forms so far described are nothing but artifacts, and result from pathological alterations of the fibrin and collagen contained in the haemorrhagic foci of the spleen; or else they have been produced by contaminations with common mould fungi. He considers that the question is yet far from being definitely solved, and requires further study.

Pinoy (E.) & Nanta (A.). **Aspergillose expérimentale chez le lapin.** [Experimental aspergillosis in the rabbit.]—*Comptes rendus Soc. de Biol.*, xcvii, 19, pp. 67–68, 1927.

Aspergillus nantae (stated to have been described in a note submitted to the Congrès pour l'Avancement des Sciences, April, 1927) is characterized by the vivid green colour of the conidia, their small dimensions (always less than 2·6 μ), and their slow development. No perithecia have yet developed in culture, but thin-walled, sterile, perithecium-like bodies, similar to those of *A. nicollei*, have been observed in the tissues of patients suffering from splenomegaly. The mycelial membrane may be very delicate and scarcely discernible, or very thick and diffuse. Rabbits inoculated with cultures of *A. nantae* developed acute symptoms of paralysis and emaciation [see next abstract]. The renal lesions were similar to those induced by *A. fumigatus.* No giant cells enclosing conidia were found, as in the case of *A. jeanselmei.*

Gosset (A.), Bertrand (I.), & Magrou (J.). **Recherches expérimentales sur l'aspergillose splénique.** [Experimental researches on splenetic aspergillosis.]—*Comptes rendus Soc. de Biol.*, xcviii, 10, pp. 769–770, 1928.

A rabbit inoculated with a suspension of *Aspergillus nantae* [see preceding abstract] developed progressive symptoms of splenomegaly [*R.A.M.*, vii, pp. 377, 378] and died in about six weeks. No trace of mycelial hyphae could be detected in an examination of the intestinal tissues, but ovoid, brownish bodies, with a maximum diameter of 15 to 20 μ, were formed in the spleen and ascitic liquid. These bodies are thought to be degenerate mycelial elements and to correspond exactly with certain of those found in splenomegaly. The disappearance of the fungus from the lesions is regarded as a possible indication of a filterable form of *A. nantae.*

Pinoy (E.). **Diagnostic microbiologique de la mycose splénique.** [Microbiological diagnosis of splenetic mycosis.]—*XIX^e Congr. Franç. de Méd.*, Paris, 1927. [Abs. in *Bull. Inst. Pasteur*, xxvi, 10, p. 446, 1928.]

The difficulty of culturing the organisms isolated from the Gandy-Gamna nodules [in cases of splenomegaly] is attributed to the fact that the hyphae are usually dead. In sections, typical mycelial forms are rare, the majority being readily confused with degenerated connective tissue fibres. *Aspergillus nidulans* [*R.A.M.*, vii, p. 377] is stated to be a very variable species: a strain producing white perithecia was isolated from a patient with non-tuberculous bronchitis. Old cultures of *A. nidulans* var. *nicollei* resemble those of certain species of *Madurella*, hence the possibility of a connexion between these genera.

Crookshank (F. G.). **Splenomegaly associated with aspergillosis.** —*The Lancet*, ccxiv, 5462, p. 933, 1928.

With reference to the discussion now proceeding in connexion with the etiology of Banti's disease or splenomegaly [see preceding abstracts], the author draws attention to an important paper by A. G. Gibson (*Proc. Roy. Soc. Med.* (*Med. Sect.*), vii, p. 7, 1913), in

which the presence of mycelium of *Aspergillus nidulans* was demonstrated in a group of cases.

BRUHNS (C.). **Einige Bemerkungen über verschiedene Pilzarten und Pilznährböden (Grütz-Agar, Pollacci-Agar).** [Some observations on various species of fungi and culture media (Grütz-Agar, Pollacci-Agar).]—*Dermatol. Zeitschr.*, liii, pp. 104–112, 4 figs., 1928.

On the whole, the author considers that Sabouraud's method of classification of the dermatophytes on the basis of the macroscopic appearance of the cultures, the *ensemble* of the microscopic examination of scrapings and cultures, and animal inoculation, has stood the test of time, and none of the recent attempts to supersede it has proved successful.

The tendency to regard all cultures showing slight deviations from the standard type of growth as new species is much to be deprecated. Examples of this confusion are *Microsporon xanthodesum*, which is almost certainly identical with *Achorion gypseum*; *M. fulvum* is closely allied to, and may be the same as, *M. felineum*; *M. radiatum* is probably one of the well-known *M.* species of animal origin; *M. scorteum* is only a variant of *M. fulvum* or *M. felineum*, and there seems to be no reason for separating *A. serisei* from *A. gypseum*. In the author's experiments, a fungus isolated from ringworm of the scalp yielded typical cultures of *M. audouini* on Sabouraud's medium, as well as on Pollacci's medium and peptone agar, while on Grütz maltose (5 gm. peptone Knoll, 80 gm. Nervina malt from Christiansen, Flensburg, and 1,000 gm. 1·8 per cent. agar) the colonies resembled those of *M. depauperatum* or *M. pertenue*, indicating that these are probably only forms of *M. audouini*. It is evident that many so-called new species have been separated on insufficient grounds.

Details are given of the growth characters of various pathogenic fungi, e.g., *A. schoenleini*, *Epidermophyton lanoroseum*, *M. lanosum*, *M. ferrugineum*, *Trichophyton gypseum asteroides*, *T. violaceum*, *T. persicolor*, *T. niveum*, and *T. cerebriforme*, on Pollacci's medium, consisting of 500 gm. of boiled beef filtrate, 10 gm. peptone (Witte), 5 gm. sodium chloride, 5 gm. agar, with the addition (after re-boiling and filtering, neutralization, and half-an-hour's final boiling) of 70 gm. glucose. This medium was found to be very useful in the clear differentiation of the colours of the organisms used.

KINGERY (L. B.) & ADKISSON (ALVA). **Certain volatile oils and stearoptens as fungicides.**—*Arch. of Dermatology*, xvii, 4, pp. 499–511, 9 figs., 1928.

An attempt was made to establish experimentally the possible efficacy of certain volatile oils in the treatment of various human pathogenic fungi, including *Epidermophyton rubrum*, *E. inguinale*, *Trichophyton pedis*, *T. gypseum radiolatum*, *T. interdigitale*, *Microsporon fulvum*, *M. lanosum*, *Achorion gypseum*, *A. quinckeanum*, *A. schoenleini*, *Coccidioides immitis*, *Sporotrichum schenckii*, and an unspecified agent of blastomycosis. The best results were given by the aqueous solutions of thymol (up to 1 in 7,500), cinnamon,

and clove in the order named. Of the other substances used iodine approximated most closely to thymol in rapidity of action, while an equally popular drug, benzoic acid, proved relatively ineffective. Salicylic acid, sulphur, and chrysarobin were of only moderate efficacy.

KARRENBERG (C. L.). **The present state of epidermophytosis in Europe.**—*Arch. of Dermatology*, xvii, 4, pp. 519–532, 1928.

This paper presents the results of an extensive inquiry into the numerical occurrence of epidermophytosis, the different causative fungi, and the various clinical aspects of the disease in Europe and Japan. In Hamburg (where the writer resides) epidermophytosis has always been frequent, 65 among 114 cases of human fungous diseases in 1926 being traced to this source. Generally speaking, the condition appears to be slightly on the increase in the countries supplying information. The numerous species described as *Epidermophyton* may be classified in three groups: (1) *E. inguinale*; (2) *E. rubrum*, including *E. perneti*, *E. salmoneum*, *E.* Keller, 1926, *E. lanoroseum*, *Trichophyton rubidum*, *T. A.* (Hodges), and *T. purpureum* Bang, variations I and II Takahashi; (3) *E.* Kaufmann-Wolf or *E. interdigitale* (for which the name *E. variabile* is proposed as a substitute). Notes are given on the symptoms and treatment of the condition.

KEIM (H. L.). **Impressions of dermatology in North China.**—*Arch. of Dermatology*, xvii, 5, pp. 619–624, 1928.

The writer describes his impressions of dermatology in North China, derived from the annual examination of some 100,000 out-patients at the Pekin Union Medical College. Fungous infections of the skin are stated to be common and are represented by essentially the same pathogenic fungi and the same clinical characteristics as in other parts of the temperate zone. Both tinea tonsurans and tinea favosa of the scalp are astonishingly common, due to the use of contaminated instruments by itinerant barbers. The former condition is mainly associated with *Trichophyton megalosporon-endothrix*, while *T. m. ectothrix* is responsible for practically all the rest of the infection. The mycotic infections of the group of granulomas, blastomycosis, sporotrichosis, and actinomycosis are little in evidence.

HALLAM (R.). **Fungous infections of the hands and feet.**—*Brit. Med. Journ.*, 3515, pp. 835–838, 2 figs., 1928.

Fungous infections of the hands and feet are discussed under three headings, viz. (1) infection of the interdigital clefts; (2) acute vesicular eruption of the hands and feet (also known as cheiropompholyx or dysidrosis); and (3) infection of the nails. The first condition is stated to be frequently due to infection by the causal organism of tinea cruris (*Epidermophyton*) [*inguinale*: *R.A.M.*, vii, p. 170]; the second to *Trichophyton* [ibid., vi, p. 484]; and the third to *Trichophyton* or to *Oospora albicans* [ibid., vii, p. 239]. Clinical details of the various conditions and recommendations for treatment are given.

Castellani (A.). **Mycoses.**—*Brit. Med. Journ.*, 3517, p. 958, 1928.

Mycotic infections of the hands and feet [see preceding abstract] are stated to be extremely frequent in all countries with a warm, moist climate, such as Louisiana, Mississippi, parts of southern Italy, Spain, and the Balkans. In New Orleans over 30 per cent. of the medical students suffer from epidermophytosis of the toes associated with *Epidermophyton inguinale* and *E. rubrum* [regarded by Acton & McGuire as a synonym of the last: *R.A.M.*, vii, p. 170]. Another condition stated to be far from rare in the tropics and in temperate zones, but often overlooked, is furunculosis or pyosis due to *Cryptococcus* or *Monilia*. In this affection boils may appear on various parts of the body or the scalp may be chiefly attacked.

Walthard (B.). **Zur Pathogenese des dysidrotischen Symptomenkomplexes. Über ein unter dem Bilde einer Dysidrosis verlaufendes Epidermophytid.** [On the pathogenesis of the dysidrotic symptom complex. On an Epidermophytid developing under the guise of a dysidrosis.]—*Dermatol. Zeitschr.*, liii, pp. 692–706, 1928.

A species of *Epidermophyton*, possibly *E. lanoroseum* [*R.A.M.*, vi, p. 484], was isolated from lesions on the feet of a 13-year-old girl, who was also suffering from typical dysidrosis of both hands and papulo-vesiculose exanthema of the arms. The latter manifestations are believed to be of a purely secondary character, due to contamination from the primary seat of infection on the feet. The patient reacted in a marked degree to intracutaneous injection with trichophytine.

Photinos (P.). **Dermatomycose symétrique palmaire datant de onze ans due au Trichophyton faviforme ochraceum.** [Symmetrical palmary dermatomycosis of eleven years' standing due to *Trichophyton faviforme ochraceum*.]—*Bull. Soc. Franç. de Dermatol., 1928*, 2, pp. 118–120, 1928.

Attention is drawn to the slow development of *Trichophyton faviforme ochraceum* [*R.A.M.*, vi, p. 416], isolated from palmary lesions on the hands of a Parisian business man. It was impossible to detect any trace of the fungus by microscopic examination of the vesicles and squamae, and for six weeks there was no sign of any development in the test tubes. In connexion with this experience Dr. Sabouraud emphasizes the necessity for patience in all cultural work, since sterility, as in the present case, may be only apparent.

Martins (C.). **Microsporum lanosum et trois espèces cryptogamiques satellites isolées dans un cas de teigne tondante.** [*Microsporum lanosum* and three associated cryptogamic species isolated from a case of ringworm of the scalp.]—*Comptes rendus Soc. de Biol.*, xcviii, 13, pp. 1164–1166, 1928.

From the squamae on the scalp of a child suffering from ringworm the writer isolated a species of *Microsporon*, in all probability *M.*

lanosum, which was characterized by a marked degree of pleomorphism on Sabouraud's medium at a temperature of 10° to 12° C. This phenomenon is attributed to the simultaneous development in the test tube of three associated species. The animal origin of the fungi was demonstrated by the abundant growth of yellowish, fusiform, mostly septate conidia similar to, but somewhat larger than, those developing in cultures isolated from the hairs of a dog which had been in contact with the child.

RAVAUT (P.), BASCH, & RABEAU. **Épidémie de trichophytie cutanée déterminée par le Trichophyton niveum radians (Sabouraud). Polymorphisme des lésions, réactions humorales.** [Epidemic of cutaneous trichophytosis caused by *Trichophyton niveum radians* (Sabouraud). Polymorphism of the lesions, humoral reactions.]—*La Presse Méd.*, xxxvi, 39, pp. 609–612, 16 figs., 1928.

During the period 1923 to 1927 there was an epidemic of cutaneous trichophytosis among the female employees in an annex of the French Ministry of Finance. Out of some 1,000 women 194 were treated by the writers for lesions on the neck, the upper part of the thorax, and the arms. The fungus *Trichophyton niveum radians* (believed to have been introduced into the building by a cat) was isolated from the lesions in practically every case. Valuable results [which are described] were given by the injection of trichophytine from various sources, monovalent and polyvalent. The lesions caused by *T. niveum radians* appear to be particularly responsive to this method of treatment.

WILENCZYK (A.). **La formation d'asques chez Achorion schönleini (favus).** [The formation of asci in *Achorion schoenleini* (favus).]—*Comptes rendus Soc. de Biol.*, xcviii, 12, pp. 1049–1050, 1 fig., 1928.

In continuation of his experiments with *Trichophyton* [*R.A.M.*, vii, p. 241], the writer carried out similar tests with the causal organism of favus (*Achorion schoenleini*). A conidium derived from a sub-culture on Sabouraud's medium was transferred to the modified medium used in the previous experiments and the culture kept for three weeks at 37° C., after which it was placed at room temperature. Under the latter conditions yellow, round or oval asci, containing 4, 6, or 8 spores and closely resembling those of *Trichophyton*, were formed in such profusion as to impart a dark tinge to the cultures. Recent investigations have shown that both in *Trichophyton* and *A. schoenleini* the asci may be isolated directly from infected squamae or hairs.

MACLEOD (J. M. H.) & DOWLING (G. B.). **An experimental study of the Pityrosporon of Malassez: its morphology, cultivation and pathogenicity.**—*Brit. Journ. of Dermatology*, xl, 4, pp. 139–148, 1 pl., 3 figs., 1928.

The morphology of the *Pityrosporon* of Malassez [*P. ovale*: *R.A.M.*, vii, p. 325] can be studied in preparations of scales and scrapings soaked in liquor potassae, and in stained preparations of scales or cultures. The organism takes the usual aniline dyes and

is Gram-positive. The spores are pleomorphic, generally occurring in chains composed of up to 20 or more individuals, and measure 3 to 7 by 2 to 6 μ. The fungus grows on maltose agar, acid glycerine agar, and peptone broth (with the addition of 1 per cent. oleic acid and 1 per cent. glucose) at 25° C. Slight gas formation occurs in maltose and glucose, with acidification of the medium. Gelatine is not liquefied.

P. ovale has long been accepted as the probable cause of pityriasis capitis, and the authors' observations and experiments [which are briefly described] led to the conclusion that it is also an important agent in the etiology of seborrhoeic dermatitis and other pathological conditions of the skin.

SARTORY (A.), SARTORY (R.), & MEYER (J.). **Sur un cas d'onychomycose produit par le 'Sporotrichum Beurmanni' de Beurmann et Ramond.** [On a case of onychomycosis produced by *Sporotrichum beurmanni* de Beurmann et Ramond.]—*Bull. Acad. Méd.*, xcix, 13, pp. 386–388, 1928.

From the pus exuded by the greyish-white lesions on the nails of the thumb and index finger (in both hands) of a patient, the writers isolated a fungus which was cultured on Sabouraud's and other media at 25° C. The mycelium produced under these conditions is composed of slender, septate, much branched, hyaline (later chocolate-brown) hyphae, 2 μ in diameter. The pyriform to oval conidia measure 3·5 to 6 by 2·5 to 4 μ. Numerous chlamydospores of variable dimensions were also detected. The fungus was identified as *Sporotrichum beurmanni* [*R.A.M.*, vii, p. 240]. The pathological condition of the nails was relieved by the application of chrysarobin ointment with doses of potassium iodide (2 gm. per diem).

CSONTOS (J.). **La sporotrichose des oeufs.** [Sporotrichosis of eggs.]—*Közlemén. Összehasonlító élét-Kórtan Köréböl*, xx, p. 160, 1927. [Abs. in *Bull. Inst. Pasteur*, xxvi, 10, p. 457, 1928.]

Twenty to fifty per cent. of the stale eggs examined in Hungarian markets were found to contain a species of *Sporotrichum* similar to, if not identical with, that described by de Beurmann, Matruchot, and Ramond [*S. beurmanni*]. The white of the egg undergoes a gelatinous transformation and the colonies form patches adhering to the shell or membrane. Infection may be prevented by sanitary measures coupled with the storage of the eggs in a dry place.

MARTINS (C.). **Zymonema pulmonalis membranogenes isolé d'un crachat de pneumopathie grave et mortelle.** [*Zymonema pulmonalis membranogenes* isolated from a sputum in a serious and fatal case of pneumopathy.]—*Comptes rendus Soc. de Biol.*, xcviii, 13, pp. 1162–1164, 1928.

From the sputum of a boy suffering from an obscure but severe pathological condition of the lungs, the writer isolated, on Sabouraud's and other media, a fungus characterized by a Gram-negative, non-acid-fast, septate, whitish-yellow mycelium. Reproduction occurs exclusively by means of arthrospores and chlamydospores.

The organism, which grew best at 37° C., is placed in the genus *Zymonema* (de Beurmann and Gougerot, 1909) under the name of *Z. pulmonalis membranogenes* n. sp. The intravenal inoculation of rabbits gave negative results, but similar experiments on dogs led to emaciation. Guinea-pigs inoculated subcutaneously developed callosities in the region of the injections: intraperitoneal inoculation gave negative results.

MONTPELLIER (J.) & CATANEI (A.). **Mycose humaine due à un champignon du genre Hormodendron, H. algeriensis n. sp.** [Human mycosis due to a fungus of the genus *Hormodendrum*, *H. algeriensis* n. sp.]—*Ann. de Dermatol.*, viii, 6, pp. 626–635, 1927. [Abs. in *Bull. Inst. Pasteur*, xxvi, 10, pp. 458-459, 1928.]

A 60-year-old native of Algeria developed, on the right leg, polymorphous, framboesioid, ulcerous lesions, from which was isolated a fungus producing flocculent, dark green (later deep brown) colonies. The septate, branched mycelium produced erect septate conidiophores bearing very fragile chains of septate conidia. Local lesions were induced in rabbits by inoculation with the fungus, which is identified as a *Hormodendrum* and named *H. algeriensis* n. sp. Two other species of *Hormodendrum* are stated to be known as human parasites, viz., *H. fontoynonti* Langeron, 1913, and *H. langeroni* [*R.A.M.*, vii, p. 240].

BENEDEK (T.). **Vergleichende Untersuchungen über einige Arten der Gattung 'Cephalosporium' nebst Mitteilung einer neuen Art: 'Cephalospor. niveolanosum' nov. spec.** [Comparative investigations of several species of the genus *Cephalosporium*, together with a note on a new species: *Cephalosporium niveolanosum* n. sp.]—*Arch. für Dermatol.*, cliv, 1, pp. 154–167, 11 figs., 1928.

Detailed macroscopic and microscopic investigations [which are fully described] of (1) a new species of *Cephalosporium* isolated by the author from a case of dermatitis; (2) a species tentatively designated by Grütz as *Acremonium kiliense*; and (3) a species of *Cephalosporium* described by Hartmann (*Dermatol. Wochenschr.*, lxxxii, p. 565, 1926) led to all three being referred to the same genus and named as follows. (1) *C. niveolanosum* n. sp., characterized by elongated, greenish conidia, measuring 5·2 by 2·6 μ; (2) *C. asteroides griseum grützii* (Grütz) Benedek, possessing straight or comma-shaped, bacilliform, greenish conidia, 3 by 1·5 μ; and (3) *C. rubobrunneum cerebriforme hartmannii* Benedek, characterized by ellipsoid or ovoid conidia, closely resembling those of *C. niveolanosum* but considerably smaller (3 by 2 μ). Latin diagnoses of all three species are given.

BENEDEK (T.). **Über Cephalosporiose. Ein Beitrag zur Kenntnis der seltenen Mykosen, unter besonderer Berücksichtigung der Serumdiagnose.** [On cephalosporiosis. A contribution to the knowledge of the rare mycoses, with special reference to the serum diagnosis.]—*Arch. für Dermatol.*, cliv, 1, pp. 96–107, 1928.

In connexion with the study of a case of epidermal cephalo-

sporiosis caused by *Cephalosporium niveolanosum* [see preceding abstract], a full discussion of the serological diagnosis is given, with some suggestions for the application of the resulting data to mycological investigation. Positive complement fixation and agglutination were found to exist between the homologous serum and the homologous etiological agent, while a marked group reaction was observed with the two related species described by Grütz and Hartmann and the homologous serum. The causative nature of the parasite is thought to be sufficiently demonstrated by these immuno-biological relations.

JEANSELME [E.], HUET (L.), & LOTTE. **Nouveau type de mycétome à grains noirs, dû à une Torula encore non décrite.** [New type of black-grained mycetoma, due to a *Torula* not hitherto described.]—*Bull. Soc. Franç. de Dermatol., 1928*, 5, pp. 369–375, 3 figs., 1928.

From the black grains of a swelling on the right foot of a female native of Martinique the writers isolated, on Sabouraud's medium, an apparently new species of *Torula* characterized by highly coloured, septate hyphae (generally coremiate), and by numerous very easily detached conidia reproducing by budding and answering to the definition of blastospores. The fungus has been named *T. jeanselmei*.

SMITH (E. C.). **Moniliasis linguae.**—*Journ. Trop. Med. & Hygiene*, xxxi, 9, pp. 101–102, 3 figs., 1928.

Infants examined at the African Hospital at Lagos [Nigeria] frequently show a condition akin to thrush, characterized by the presence on the tongue of small, white patches, generally accompanied by swelling and inflammation. The mucous membrane of the lips and soft palate may be similarly affected. Fragments of false membrane placed on Sabouraud's glucose agar yielded a prolific, creamy white growth composed of Gram-positive, budding, yeast-like bodies, with occasional mycelial elements. Acid and gas were produced in levulose, maltose, and glucose after one week's incubation at 37° C. This would place the organism in Castellani's *Monilia* [? *Candida*] *pinoyi* group [*R.A.M.*, vii, p. 325]. Intramuscular inoculations in guinea-pigs produced small localized abscesses, from which the fungus was readily recovered. A brief observation is made on the relations between the organism and the lingual epithelium.

MILES (H. W.). **Azalea culture in Belgium.**—*Journ. Min. Agric.*, xxxv, 2, pp. 137–147, 7 figs., 1928.

In the section of this paper which deals with fungous diseases of azaleas under cultivation in Belgium, it is stated that vast numbers of plants are annually lost or rendered unfit for export by a dry rot associated with a species of *Ramularia*. The disease develops in the stem, just above the ground; the tissue under the bark turns black, and the stem becomes loose in the ground. Plants worked on *Azalea concinna* stocks are more susceptible than those on *A. phoenicea* stocks. Infection is considered to be favoured by excessively deep planting and overwatering in summer, and by

fluctuating temperatures during the growing period. *Septoria azaleae* [*R.A.M.*, vi, p. 615] is most severe on the Madame Petrick variety. Preventive methods include the use of clean stock, grafts from healthy plants, and summer spraying with lime-sulphur. Certain varieties, especially Niobe, Deutsche Perle, and Professor Wolters are very susceptible to *Exobasidium vaccinii* [? *E. rhododendri*: ibid., iv, p. 672] which appears to be most prevalent where pine needle soil is used. The characteristic hypertrophy of the leaves is apparent from February to May. Some growers periodically cut out and burn the infected parts, while others claim to have secured good results from the use of weak Bordeaux mixture.

BAUDYŠ (E.). **Bakteriosa Mečíku.** [A bacterial disease of Gladiolus.]—*Ochrana Rostlin*, viii, 2–3, pp. 49–51, 2 figs., 1928. [German summary.]

The author records the first appearance in Moravia, in the spring of 1928, of the dry rot of gladiolus corms caused by *Bacterium marginatum*. The symptoms of the disease and the morphology of the causal organism entirely agreed with those published in the United States [*R.A.M.*, iv, p. 286]. The infectious nature of the disease is stressed, and the control measures recommended include steeping the pre-soaked corms for one hour in a 0·1 per cent. solution of mercuric chloride or of formalin, or for two hours in a 0·25 per cent. solution of germisan or uspulun. Infected soil should receive abundant applications of lime, and all diseased plants should be burnt or buried deeply in the soil. Good results were also obtained by spraying the growing plants with a 0·1 per cent. Bordeaux mixture.

PAPE (H.). **Krankheiten und Schädlinge der Futter- und Wiesenpflanzen und ihre Bekämpfung.** [Diseases and pests of fodder and meadow crops and their control.]—*Deutsche Landw. Presse*, lv, 6, p. 83; 18, p. 270; 25, p. 378; 28, p. 418, 4 figs., 1928.

One of the principal fungous diseases of clover in Germany is the canker or stem rot due to *Sclerotinia trifoliorum*, which chiefly attacks the red variety [*Trifolium pratense*: *R.A.M.*, vi, p. 731; vii, p. 449]. Plants grown from seed of foreign origin are particularly susceptible. Control measures should include the use of selected German or Central European seed and the avoidance of excessive fertilizing, especially with nitrogen and liquid manure. The sclerotia are known to remain viable in the soil for two years, and in severe infection the crop should be ploughed up immediately after the first cut, if not before, in order to prevent their germination. In localities where this disease occurs in a severe form, a mixture of grass and clover should be substituted for pure clover stands.

The use of home-grown seed, combined with the destruction of infected material, crop rotation with cereals, and the application of caustic lime to the soil, is also recommended for the control of *Rhizoctonia violacea* [*R. crocorum*: ibid., vi, p. 756].

Heavy damage may also be caused by anthracnose (*Gloeosporium caulivorum*) [*Kabatiella caulivora*: ibid., vii, p. 583], which is stated to be particularly severe on clovers of American origin.

Among the leaf diseases of fodder crops causing considerable injury under unfavourable environmental conditions may be mentioned scab (*Scirrhia agrostidis*) of white bent grass [*Agrostis alba*]. Both lucerne and clover are subject to a white speckling of the foliage caused by a deficiency of potash in the soil [ibid., iii, p. 230].

Brief notes are also given on the occurrence of *Epichloë typhina* on various grasses [ibid., vii, p. 327] and of *Sclerotium rhizodes* on reed grass [*Phalaris arundinacea*: ibid., v, p. 743].

Scotland: Sclerotinia trifoliorum from infected Clover seed.—*Intern. Rev. of Agric.*, N.S., xix, 5, p. 486, 1928.

Imported white clover (*Trifolium repens*) examined at the Scottish Board of Agriculture showed the presence of a plentiful white mycelium in a loose weft between the embryo and seed-coat. On the seed-coat of cleaned and moistened seeds a round, black sclerotium with a white interior was produced, and numerous sclerotia developed in cultures of the mycelium from within the seeds. Apothecia in great profusion were produced by these sclerotia sown on sterile wet sand. The small brown cups arose from the black sclerotia on short stems varying in number from one to a dozen from a single sclerotium. The fungus was identified as *Sclerotinia trifoliorum* [see preceding abstract].

McCulloch (Lucia). **Bacterium stizolobii (Wolf) comb. nov. syn. Aplanobacter stizolobii.**—*Phytopath.*, xviii, 5, p. 460, 1928.

In the original paper (*Phytopath.*, x, p. 73, 1920) *Bacterium stizolobii* [the causal organism of the bacterial leaf spot of *Stizolobium deeringianum*] is described as non-motile and devoid of flagella, but later a single, short, polar flagellum was stained by the Casares-Gil and David Ellis methods. The organism is apparently non-motile in most cultures and also when examined directly from leaf lesions. Slight but definite motility was observed in young beef agar cultures and in these the flagella were demonstrated.

Bourn (W. S.) & Jenkins (Bernice). **Rhizoctonia disease on certain aquatic plants.**—*Bot. Gaz.*, lxxxv, 4, pp. 413–425, 4 figs., 1 graph, 1 map, 1928.

Large areas (about 300 sq. miles) of aquatic duck food plants comprising five species, viz., *Potamogeton pectinatus*, *P. perfoliatus*, *Ruppia maritima*, *Vallisneria spiralis*, and *Naias flexilis*, have been destroyed by a fungous disease in Back Bay, Virginia, and Currituck Sound, North Carolina. Wild duck and geese are no longer attracted to these waters, with the result that considerable economic loss has been inflicted on a large population dependent on sport for a livelihood. An investigation was accordingly undertaken in 1926 to determine the cause of the trouble.

Pure cultures of a strain of *Rhizoctonia* have repeatedly been isolated from diseased plants in the infected waters, and typical symptoms of the disease were produced in greenhouse aquarium plants by inoculations with the fungus. Later, pure cultures of the organism were reisolated from the infected plants. Inoculations on the potato resulted in the development of dark brown stem lesions

and scabbing and russeting of the tubers. Morphological and cultural studies indicate that this fungus is a physiological strain of *R. solani*, this being apparently the first record of its occurrence on aquatic plants.

A strain of the fungus isolated from diseased potatoes has been found to infect aquatic plants growing in various types of soils and salt solutions. The resulting disease was identical with that caused by the aquatic strain of *R. solani*, but it occurred at lower saline concentrations. The most favourable environment for infection of the aquatic plants by *R. solani* is said to be a muck soil with a salinity of 7 to 20 per cent.

GLAUSCH (R.). **Anwendung der Motorbaumspritze im Bezirk Grossenhain.** [Use of the motor apparatus for spraying trees in the Grossenhain district.]—*Die Kranke Pflanze*, v, 4, pp. 57–60, 2 figs., 1928.

In the Grossenhain district [Saxony], where the average annual yield of fruit is estimated at 609,000 cwt. valued at M. 6,000,000, the treatment of orchard and wayside trees against fungous diseases and insect pests with a motor spraying apparatus has been instituted on co-operative lines. The total cost of the treatment, which can be applied to 1,000 wayside trees daily and a somewhat smaller number in the orchard, is approximately Pf. 6 to 10 per m., calculated by the average diameter of the crown. At present only one such apparatus is available, supplied by the Dresden plant protection headquarters, but a further extension of the work is anticipated.

SMITH (R. E.) & THOMAS (H. E.). **Copper sulphate as a remedy for exanthema in Prunes, Apples, Pears, and Olives.**—*Phytopath.*, xviii, 5, pp. 449–454, 4 figs., 1928.

Exanthema or die-back of citrus trees [*R.A.M.*, vi, p. 667] has long been known to occur in California, but the disease is less familiar on other species of fruit which may be similarly affected in poorly drained soils with a moisture content fluctuating between saturation and drought.

French prune trees (*Prunus domestica*) showing a withering of the terminal buds and a yellow discoloration of the terminal leaves, accompanied by bark eruptions and the production of swollen and multiple buds, received an application of copper sulphate (5 lb. per tree) in addition to various standard fertilizers [which are listed]. The material was scattered round the tree and dug into the soil by hand. In a subsequent experiment 2½ lb. of copper sulphate per tree was applied. All the treated trees (over 100), with one or two exceptions, responded to the treatment and completely recovered their normal vigour [cf. ibid., iv, p. 411]. None of the fertilizers exercised any beneficial effect apart from the copper sulphate.

A very badly affected apple tree, with a mass of bushy, yellow, die-back shoots at the top, was surrounded by a trench into which 2 lb. copper sulphate crystals were sprinkled half way round the circumference of the tree. The trench was filled with water after separating the treated portion from the other half with earth. In less than two months the twigs on the treated side of the tree

showed a marked improvement, while those on the other part had become progressively worse.

Similar promising results have been given by the application of copper sulphate to Bartlett pear and young olive trees.

GARDNER (V. R.). **Cutting corners and cutting profits in spraying.**—*Quart. Bull. Michigan Agric. Exper. Stat.*, x, 3, pp. 88–92, 1928.

At the retail prices prevailing in Michigan the cost per gall. of lime-sulphur 1 in 40, is $0·00425, of lead arsenate 1 in 50, $0·0034, and of nicotine sulphate 1 in 800, $0·0162. Assuming that two men and one team apply 1,200 galls. in a ten-hour day, the cost of labour amounts to $0·0088 per gall. of fluid used; the upkeep and depreciation of the machine is estimated at $0·0066 per gall.

In the author's opinion, not less than 10 galls. of spray should be given to a mature apple tree at each application; this amount is estimated for in the figures given below.

In the Michigan spray calendar for apples, seven applications are listed, of which the pink, calyx, 10-day or 2 weeks, and August sprays, each consisting of lime-sulphur (1 in 40) and lead arsenate (1 in 50), are an irreducible minimum which, in the author's opinion, requires to be augmented by the pre-pink application.

The total cost of the 'minimum' schedule amounts to $0·92 per tree, or $27·6 per acre, assuming 30 trees to the acre; the pre-pink spraying of lime-sulphur (1 in 40) and nicotine sulphate (1 in 800) would increase this by about 36 cents per tree, or $10·75 per acre, making a total cost for the five applications of $1·26 per tree or $38·35 per acre. As the average annual yield per mature tree in the apple orchards in Michigan is 6·5 bushels, the spraying cost is equivalent to rather less than 20 cents per bushel of tree-run product.

The value of the fruit being only about $0·63 per bushel in the orchard the author urges that growers should indirectly reduce their spraying expenses by making every effort to increase the yield of their trees. He points out that some local orchards annually produce as much as 12 bushels of fruit per tree; this additional yield entails no extra expense in spraying, but reduces its comparative cost by nearly 50 per cent. Some economy may also be effected by expediting the spraying, but any attempt to economize by reducing the concentration, amount, or number of the applications is strongly deprecated.

WILSON (E. E.). **Studies of the ascigerous stage of Venturia inaequalis (Cke.) Wint. in relation to certain factors of the environment.**—*Phytopath.*, xviii, 5, pp. 375–418, 2 pl., 2 figs., 3 graphs, 1928.

This is an amplified account of the author's studies in connexion with the perithecial stage of *Venturia inaequalis*, a preliminary notice of which has already appeared [*R.A.M.*, vii, p. 451].

KNOCHE (R.). **Vom vorzeitigen Laubabwurf beim Gravensteiner.** [On premature leaf fall in Gravensteins.]—*Obst- und Gemüsebau*, lxxiv, 5, pp. 77–78, 1 fig., 1928.

The writer attributes the extensive defoliation of Gravenstein

and other apple varieties in North Germany in 1927 exclusively to scab (*Fusicladium*) [*Venturia inaequalis*: *R.A.M.*, vii, p. 520]. The prevalent opinion that *Psylla mali* is responsible for this phenomenon is untenable, since severe damage has been observed for many years past in districts and on trees where this insect is absent. Notes are given on the susceptibility to scab of a large number of apple varieties.

FROMME (F. D.). **The black rootrot disease of Apple.**—*Virginia Agric. Exper. Stat. Tech. Bull.* 34, 52 pp., 20 figs., 1928.

This is the full account of the author's investigation of the black root rot of apple, a summary of which has already been noticed from another source [*R.A.M.*, vii, p. 453]. The causal organism commonly associated with the disease in Virginia is apparently identical with *Xylaria digitata* as understood by Ellis in America, but differs from the true (European) *X. digitata* (L.) Grev., as represented in various herbaria in the United States, in its richly branched stromata, the compressed and blunt tips of the stromatic arms, the pigmented area in which the perithecia are deeply embedded, and the size of its ascospores (12 to 16 by 5 to 6 μ, against 18 to 20 by 5 to 6 μ in the European form). The American fungus is therefore considered to be a distinct species from *X. digitata* and is renamed *X. mali* nom. nov., a diagnosis in English being given.

The fungus was readily grown on various media, and produced stromata which bore conidia, but consistently failed to form perithecia and ascospores. A brief description is given of its cultural characters as compared with those of the rather similar *X. cornu-damae* and also of *X. polymorpha* (which is stated to occur occasionally as a weak parasite on apple in Virginia, and to be more common in the northern States, especially New York) [ibid., v, p. 499] and *X. longeana* (which appears to be a common saprophyte, rarely found on dead apple wood).

In Virginia *X. mali* is of fairly common occurrence on apple, and there is evidence that it also occurs in the States of West Virginia, North and South Carolina, Kentucky, Tennessee, Indiana, Illinois, and Arkansas. So far as is known, it has never been reported from outside the United States. A survey of apple orchards in the Shenandoah valley indicated that it is probably the most important single cause of the death of apple trees in that area, the average loss of trees due to it being estimated at 18 per cent. before 21 years of age. Few of the trees replanted after the removal of trees that have died from black root rot survive until bearing age.

Although apple trees attacked by *X. mali* usually exhibit signs of failing health in their aerial parts for a year or more before death, the only symptoms of diagnostic value are the condition of the roots and the development of fruiting bodies of the fungus at the base of the trunk or on the roots during the later stage of the disease. All the tissues of infected roots are invaded by the fungus and develop a dry rot; such roots quickly become spongy and brittle enough to be easily broken or separated with the finger nail. The general colour of the affected wood is cinnamon-brown, the lighter portions being cinnamon-buff, and the darker tawny-olive in colour.

The marginal zone between the diseased and healthy tissue is of a much darker brown, almost black, and is hard and firm, and dark lines or blocking layers are sometimes seen inside the area of more advanced rot. The surface of the roots is covered with more or less continuous patches of a black incrustation which is formed by the older mycelium, while here and there occasional newly-formed fans of white mycelium may be seen, especially at the margins of the lesions. Such incrustations are sometimes scanty and web-like, but they never form true rhizomorphs, and there is no visible evidence of a mycelium in the soil apart from that which occurs on and inside the roots. These symptoms allow this disease to be easily distinguished from the so-called white root rot (believed to be caused by *Clitocybe monadelpha*) which occurs in some parts of Virginia occasionally, causing an appreciable loss of apple trees.

The pathogenicity of *X. mali* to apple trees was established by direct inoculations with pure cultures of the fungus, and by planting young trees with their root in contact with pieces of infected roots or in infected soil. In these experiments, scion roots of the Northern Spy variety of apple showed considerable resistance to infection, but when they were set as replants where they were exposed to heavy infection, an appreciable percentage died of foot rot. Field observations indicated that under favourable conditions, losses of trees of the York Imperial greatly exceeded those of the Ben Davis variety. Studies of the susceptibility of commercial seedlings and a considerable number of varieties of known maternal parentage indicated that such resistance as may exist is a property of individuals rather than of varieties.

TUTIN (F.). **A biochemical note with respect to an Apple tree affected by 'silver leaf' disease.**—*Ann. Rept. Agric. & Hort, Res. Stat., Long Ashton, Bristol, for 1927*, pp. 91–92, 1 fig., [1928].

The pectin content of apparently healthy leaves from a previously diseased branch of a Keswick Codlin apple tree, which for the preceding eight years had been affected by *Stereum purpureum* [*R.A.M.*, iv, p. 547] but which recovered, was found to be 16·86 per cent., whilst that of leaves from a branch of the same tree, which had always been free from attack, amounted to 16·84 per cent. As in 1924 the percentage pectin content in silvered leaves from this tree was only 14·9, the increase is considered to confirm the view that silver leaf disease in apple trees is accompanied by pectin deficiency in the leaves.

NATTRASS (R. M.). **The occurrence of Phacidiella discolor Pot. in the Bristol province.**—*Ann. Rept. Agric. & Hort. Res. Stat. Long Ashton, Bristol, for 1927*, pp. 99–100, 1 pl., [1928].

During 1927 *Fuckelia conspicua* was observed in Worcestershire causing all stages of bark canker on 15- to 20-year-old Red Robin pear trees which had long borne heavy crops. Conidial fructifications of the fungus identical with those seen on apple trees in 1926 [*R.A.M.*, vi, p. 529] were present on the younger cankers, and abundant apothecia agreeing with *Phacidiella discolor* were found on the older ones. Monospore cultures from ascospores and conidia

were identical and produced pycnidia containing conidia similar to those found in nature [see also ibid., vii, p. 585].

Inoculations of healthy young trees with pure cultures of the fungus gave negative results.

CARNE (W. M.). **Burr-knot and stem-tumour of Apple and Quince trees.**—*Journ. Dept. Agric. Western Australia*, 2nd Ser., v, 1, pp. 123–126, 4 figs., 1928.

In Western Australia burr-knots [*R.A.M.*, vii, p. 383] are found, associated with the development of dormant aerial rootlets, on quinces and on some apple varieties, especially Northern Spy. Their formation is a varietal characteristic though formerly it was attributed to crown gall [*Bacterium tumefaciens*], a disease which has only been demonstrated in very few cases in Australia and is probably rare [ibid., vii, p. 249].

MARSH (R. W.) & NATTRASS (R. M.). **Investigations on die-back of fruit trees. I. A preliminary experiment and some field observations on Diaporthe perniciosa as a cause of 'die-back' of Plum trees.**—*Ann. Rept. Agric. & Hort. Res. Stat., Long Ashton, Bristol, for 1927*, pp. 93–98, 4 figs., [1928].

In August, 1926, sixteen Czar plum trees worked on compatible and incompatible stocks and growing under normal conditions near Bristol were inoculated with *Diaporthe perniciosa* [*R.A.M.*, iv, p. 740; vi, p. 563], half of the trees having previously been ringed. With three doubtful exceptions, all the inoculations gave positive results, while the uninoculated wounds on control trees healed well. On some cankers fructifications of *D. perniciosa* were observed, but no tree died. The cankers grew rapidly at first, but growth stopped by 1st October.

A detailed examination of one of the cankers is described. Mycelium occurred in the dead cortical tissues, but suberized cells formed a complete barrier to the spread of infection into the healthy cortex. A gum barrier had been formed in the wood, almost surrounding (except towards the pith) the infected wood. The tree had, therefore, almost completely isolated all the tissue that contained mycelium. The initial rapid growth of the canker shows that *D. perniciosa* can act as a parasite under favourable conditions, but this tree being in a vigorous condition was able to arrest the attack in two months. The ringing was not observed to favour the fungus.

Field observations in a number of areas showed that trees suffering from die-back fall into three groups: (1) young trees up to six years of age under apparently healthy conditions; (2) old trees making little growth or none at all; and (3) trees of all ages weakened by waterlogging, too deep planting, attacks by *Armillaria mellea*, and other readily ascertainable factors. Trees of the first group are usually affected in the head and upper portion of the main stem; in many instances they were growing on light soils of the kind associated with leaf scorch [ibid., vii, p. 522]. From these trees strains of *D. perniciosa* were isolated which showed considerable differences in cultural characteristics, especially in the formation of 'a' and 'b' spores and of conidia and

perithecia, and the authors suggest that there may be parasitic and non-parasitic strains of the fungus.

A case is recorded where *D. perniciosa* was observed apparently directly infecting young, vigorous, heavily manured Victoria plum trees through the buds.

Trees of the second group have grown well in the past but show abundant quantities of dead wood, on which *D. perniciosa* has been found as well as *Dermatea prunastri*. *Fomes pomaceus* is abundant on such trees, but the primary cause of this form of die-back has not been ascertained.

LUDWIGS (K.). **Spritzkalender für die wichtigsten Krankheiten und Schädlinge der Pfirsichbäume.** [Spraying calendar for the most important diseases and pests of Peach trees.]—*Obst- und Gemüsebau*, lxxiv, 5, pp. 76–77, 1 diag., 1928.

The following treatments are recommended for the control of certain fungous diseases of peach trees. (1) Leaf curl (*Exoascus* [*Taphrina*] *deformans*): dormant, early spring, and flower-bud applications of Bordeaux mixture (1 to 3 per cent. for the first two and 0·25 to 0·5 per cent. for the third). (2) Mildew [*Sphaerotheca pannosa*]: flower-bud and first fruit applications of 1 in 40 lime-sulphur or 1 per cent. solbar. (3) *Monilia* [*Sclerotinia*] *fructigena* as under (2). (4) Shot hole and shoot spot (*Clasterosporium carpophilum*) [*R.A.M.*, vi, p. 624]: flower-bud and first fruit applications: 0·25 to 0·5 per cent. Bordeaux mixture for the former, and 1 to 3 per cent. (dormant and early spring) for the latter manifestation. (5) Scab (*Fusicladium*) [*Cladosporium carpophilum*]: as under (4), the high concentration for the early spring application, and the low one for flower-bud, first fruit, and post-harvest.

LUDWIGS (K.). **Spritzkalender für die Bekämpfung der wichtigsten Schädlinge und Krankheiten der Kirschbäume.** [Spraying calendar for the control of the most important pests and diseases of Cherry trees.]—*Obst- und Gemüsebau*, lxxiv, 4, p. 58, 1 diag., 1928.

The following treatments are recommended for the control of cherry scab (*Fusicladium*) [*Venturia cerasi*]: (1) and (2) dormant and spring sprays: 2 per cent. Bordeaux mixture or 1 in 35 to 40 lime-sulphur; (3) fruit: 1 per cent. Bordeaux mixture. Shot hole [*Clasterosporium carpophilum*] may be controlled by the same schedule, supplemented by the application of a 3 to 4 per cent. Bordeaux mixture after harvest. The twig blight due to *Monilia* [*Sclerotinia cinerea*] may be combated by two applications (dormant and spring) of 3 to 4 per cent. Bordeaux mixture, while the fruit rot caused by the same organism is preventable by spraying with 1 per cent. Bordeaux when the cherries begin to form.

NATTRASS (R. M.). **The control of American Gooseberry mildew.**—*Journ. Min. Agric.*, xxxv, 2, pp. 161–167, 1928.

The author's experiments upon the control of American gooseberry mildew [*Sphaerotheca mors-uvae*: *R.A.M.*, vi, p. 238] were continued during 1927, when a colloidal sulphur spray and different forms of finely divided sulphur dusts were tested against the

standard treatment of ½ gall. ammonium polysulphide and 5 lb. soft soap in 100 galls. water.

In the first test, with Whinham's Industry bushes, one application, on 27th April, of ammonium polysulphide gave 153 lb. clean and 17·6 per cent. mildewed fruit; one application on the same date of 5 lb. each colloidal sulphur and soft soap in 100 galls. water, to a double series of bushes, gave 448 lb. clean and 10·2 per cent. mildewed fruit. Two applications of flowers of sulphur, on 27th April and 26th May, gave 210 lb. clean and 5·8 per cent. mildewed fruit. In default of suitable apparatus, the first application of the flowers of sulphur was made by throwing it violently on the ground at the foot of the bush, a method that is considered not inadequate. The untreated control gave only 23 lb. clean fruit with 69 per cent. mildewed.

In the second experiment each plot was treated on 13th April and 16th May. Proprietary soda-sulphur and soft soap (2 galls. and 5 lb., respectively, in 100 galls. water) gave 333 lb. clean and 6·4 per cent. mildewed fruit; colloidal sulphur and soft soap (4 lb. and 5 lb., respectively, in 100 galls. water) gave 225 lb. clean and 6·7 per cent. mildewed fruit. The results given by sublimated flowers of sulphur, ground sulphur, and green sulphur [see below, p. 656] were, respectively, 124, 193, and 151 lb. clean fruit with 3·1, 1, and 1·6 per cent. mildewed. The untreated control gave 96 lb. clean and 54·5 per cent. mildewed fruit. From these figures it is concluded that each of the forms of powdered sulphur used will give effective control. The colloidal sulphur did not cause scorching, and it is pointed out also that the weight of sulphur applied to each bush by this spray was less than that applied as powder.

Treatment, especially with mixtures of the Burgundy type, should not be delayed beyond the setting of the flowers; in the west of England, the best time for the first application of spray or powder is the pre-blossom stage. When the mildew has appeared, a direct killing spray containing soap should be applied at least twice.

All the forms of powdered sulphur used in the 1927 experiments gave better control than the spray fluids.

[A condensed account of these experiments is given in the Long Ashton *Annual Report for 1927*, pp. 101–103, (1928).]

Harris (R. V.). **Raspberry cane spot and its control.**—*Ann. Rept. East Malling Res. Stat. 1st January, 1927, to 31st December, 1927*, pp. 57–63, 3 pl., 1928.

Detailed instructions, which are based on experiments described in this paper and are summarized below, are given for the control of raspberry cane spot (*Plectodiscella veneta*) [*R.A.M.*, vi, p. 529]. The planting of very susceptible varieties, such as Baumforth's Seedling, Semper Fidelis, Reader's Perfection, and Devon, should be discontinued as far as possible. Where these varieties are used, or whenever the stock for planting show any trace of spotting, the cane should be drastically cut back directly after planting, the prunings being burnt. In one experiment with the Semper Fidelis variety the percentage of infection was reduced from 81 to 61 by this treatment. Both lime-sulphur and Bordeaux mixture can be

used for the treatment of affected plantations, the former being recommended on the results so far available. The first application of lime-sulphur (1 in 10) should be given when the cane buds have pushed out not more than half an inch, and the second (1 in 40) when the first flower buds are just showing white. All the old fruiting canes should be excised and burnt as soon after cropping as possible.

Strawberry investigations. (**Progress report**).—*Ann. Rept. Agric. & Hort. Res. Stat., Long Ashton, Bristol, for 1927*, pp. 58–71, [1928].

In this report the most important abnormal forms of strawberry plants are tabulated as seven types, the appearance of each being briefly noted [*R.A.M.*, vii, p. 181]. Type 1 is 'damaged crown' and results from local injury; type 2 is 'small leaf' and results from injury to the roots through careless cultivation, desiccation, or waterlogging; types 3 and 4 are, respectively, 'cauliflower' and 'red plant', and it is thought that they may be stages of the same disease due possibly to the eelworm *Aphelenchus fragariae*; type 5, 'aphis plant' was produced experimentally by infection with *Capitophorus fragariae* which the available evidence indicates as the cause of the condition; type 6 'patch' is regarded as being almost certainly a more advanced form of small leaf or aphis plant, or both, though sometimes it appears to be related to soil factors; type 7, 'sudden wilt' was prevalent only in 1924 and may be associated with excessive moisture.

Numerous attempts to transfer the red plant disease from infected to healthy plants by inoculation gave negative results, and it is considered unlikely that the disease belongs to the virus group.

In connexion with root rots of strawberry it is stated that the presence of micro-organisms in the cortex after the formation of the suberized layers in adult roots is normal and harmless. The blackening of young roots and the discoloration of the vascular tissue which are common in plants suffering from waterlogging, patch, small leaf, and sudden wilt, do not appear, except possibly in the last-named condition, to be primarily due to fungous attack; it is more probable that this follows the death of the tissues.

The only form of crown rot due to fungi which has been noted at Long Ashton was caused by *Armillaria mellea* on old, neglected strawberries growing in newly broken ground where infected woody debris may have been present.

PLAKIDAS (A. G.). **Strawberry xanthosis (yellows), a new insect-borne disease.**—*Journ. Agric. Res.*, xxxv, 12, pp. 1057–1090, 1 col. pl., 8 figs., 5 graphs, 1927. [Received 1928.]

In addition to various points already noticed from another source [*R.A.M.*, v, p. 617], this paper contains some further information on strawberry xanthosis (a term preferred by the writer to 'yellows') in the Pacific Coast States of the United States.

The results of inoculation experiments showed that the condition is not transmissible by mechanical inoculation with unfiltered juice

from diseased plants or extract from the crushed bodies of infected aphids, or by crushing diseased on to healthy leaves. Both indirect and direct evidence failed to demonstrate any relationship with curly top of sugar beets.

The data [which are tabulated] obtained in a study of the influence of temperature on the disease showed that air temperatures of 80° F. and above induce partial or complete masking of the symptoms.

Extensive cytological and histological examinations of different parts of the plants were made. A mycorrhizal fungus was repeatedly found in the small fibrous roots [ibid., vii, p. 524], but it is not considered to play any part in the causation of the trouble, since the organism was equally common in both healthy and diseased material. The palisade cells of the chlorotic leaf areas are considerably shorter and more compact than those of healthy tissues. A degeneration of the pericyclic tissues of the roots was found to be constantly associated with the disease [see next abstract]. The cells in this region frequently contained partly or totally degenerated nuclei and two types of black-staining bodies (x and y), the former composed of dense, amorphous material, and the latter being almost or quite spherical and usually with a distinct membrane.

Comprehensive tests of varietal resistance to this disease are now in progress. Of the cultivated varieties, Marshall, Oregon, Oregon Improved, New Oregon, Oregon Plum, and Banner are the most susceptible; Nick Ohmer, Melinda, and Superb slightly less so; and Early Ozark, Howard 17, Dr. Burrill, Dunlop, Premier, Parsons, Campbells Early, August Luther, and Americus comparatively resistant. The Corsican variety readily contracts the disease and shows severe yellowing, but it does not become very stunted. Of the wild species, the beach strawberry (*Fragaria chiloensis*) and practically all Etter's selections (of which over 70 have been tested) are apparently immune, while the wood strawberry (*F. californica*) is susceptible.

It is considered highly probable that the disease may be largely controlled by systematic roguing combined with the development of resistant varieties. The extermination of the insect vector, *Myzus fragaefolii*, by the application of nicotine dusts or sprays should also assist in the reduction of infection.

PLAKIDAS (A. G.). **Strawberry dwarf.**—*Phytopath.*, xviii, 5, pp. 439–444, 2 figs., 1928.

One of the main factors responsible for the reduced yield of strawberry plantings in Louisiana in recent years is a disease known as 'dwarf', a name suggested by the severe stunting of the entire plant.

The origin of the malady is obscure, but strawberry dwarf has been recognized in Louisiana for some years under the names 'wild plant' and 'white bud', and it apparently occurs in other parts of the southern United States. The leaves of affected plants are much reduced and strikingly deformed, with short petioles and somewhat elongated, asymmetrical, crinkled leaflets. The older diseased leaves are slightly greener and more shiny than healthy ones. The petioles, veins, and under side of the young leaflets are

often reddish-purple. Affected leaves are abnormally brittle. Diseased plants may become 'blind', i.e., the main bud is killed. This usually causes the death of the plants, but occasionally several adventitious buds may develop from the crown. The leaves developing from these secondary buds are small, with long, spindling petioles. Dwarfed plants are practically worthless since they produce no fruit of marketable size. In general, a dwarfed mother plant transmits the disease to all its daughter plants, but in rare cases apparently normal runners may be found. The root system of dwarfed plants appears to be entirely unaffected.

Strawberry dwarf bears a certain resemblance to yellows, reported from California [see preceding abstract], especially with respect to the stunting of the plant and the reduction in size and crinkling of the foliage. The two diseases, however, differ in other points. Chlorosis of the leaves, the principal symptom of yellows, is completely absent in dwarf. Moreover, the latter disease has so far only been found on the Klondike variety, whereas this variety was found practically immune from yellows in California.

No pathogenic organism has been found in the tissues, and the general symptomology of the disease suggests that it may belong to the virus group. This view is supported by the limited experimental evidence so far available.

On 11th November, 1927, twenty individuals of a strawberry aphid (probably *Aphis forbesi*) from leaves of dwarf plants were placed on each of six young Klondike plants in pots covered by insect-proof cages in the greenhouse. Twenty-six days later typical dwarf symptoms were observed on two of the plants, a week later two more showed similar symptoms, and by January all six inoculated plants were diseased. Of the four controls (which were also protected by cages), one died from drought, one developed dwarf symptoms, and two remained normal. Further experiments on a larger scale are now in progress.

The cytological examination of the pericyclic region of the young roots of dwarf plants showed many cells with marked signs of degeneration and containing one or more black-staining, amorphous bodies. These cell inclusions bear a marked resemblance to those occurring in the roots of strawberry plants affected by yellows [loc. cit.] and in those of sugar beets suffering from curly top (*Phytopath.*, xvi, p. 761, 1926). The nuclei of these cells are almost invariably devoid of nucleoli, the membrane appearing to be either practically empty or containing a small quantity of granular, dark-staining material.

Systematic roguing is stated to have reduced the percentage of dwarfed plants to a minimum, but in fields where this practice is neglected 10 to 20 per cent. of infection may be found.

WARD (F. S.). **Preliminary report on Fusarium cubense causing Panama disease in Malaya.**—*Malayan Agric. Journ.*, xvi, 3, pp. 76–87, 5 pl., 1928.

In May, 1927, a wilt disease of Pisang Rastali bananas was observed in Johore, one form of which was found to be of bacterial, and the other of fungal, origin. The external symptoms [which are described] were almost identical, and suggested Panama disease,

except that there was no longitudinal splitting of the outer leaf sheaths.

In the bacterial form, a transverse section of a diseased rhizome showed a yellowish-white gummy exudate from the exposed surfaces. The only indication of decay within an affected plant was usually a black ring about half-way between the centre and periphery of the section. There was no red or brown discoloration of the vascular bundles elsewhere. From the exudate a short bacillus was isolated, the cultural characteristics of which resembled those of the organism causing a wilt disease in Trinidad [*Bacterium solanacearum*: *R.A.M.*, vi, p. 496].

A transverse section near the base of a sucker affected with the fungal form of the disease showed a central heart rot throughout the pseudostem; the exudate was more liquid and more transparent than that observed in the bacterial infection. As in the latter, the central heart rotted zone showed no discoloration of the vascular bundles inside the area bounded by the diseased parts; the roots appeared healthy. The fungus isolated from the diseased tissue agreed closely with *F. cubense*.

On 18th October four young Pisang Rastali plants were inoculated with the Johore *Fusarium*, and in one plant symptoms very similar to those of Panama disease were produced except that there was no central rot of the pseudostem. Other preliminary inoculation experiments with 13 varieties gave positive results on the Pisang Embun and Pisang Su-su.

In January, 1928, a banana wilt more closely resembling Panama disease, both in the internal and external symptoms than did the form observed in Johore, was recorded in Negri Sembilan; from a plant so affected a *Fusarium* was isolated which, morphologically, agreed closely with a Philippine strain of *F. cubense*, but in cultural characteristics showed various differences [which are described] from the latter and also from the Johore strain.

Inoculation experiments with the three strains are in progress.

The varieties of banana observed to be susceptible to this disease in Malaya up to the present time are the Pisang Embun and Pisang Rastali, of which the former resembles the Gros Michel [ibid., vii, p. 588], and is the more severely attacked.

MARINANGELI (L.). **Note di olivicoltura. Di due parassiti dell' Olivo contro i quali occorre subito agire.** [Notes on the cultivation of the Olive. Two parasites of the Olive against which prompt action is necessary.]—*Il Coltivatore*, lxxiv, 12, pp. 379–382, 1928.

In this paper the author briefly describes the symptoms of leaf spot of the olive (*Cycloconium oleaginum*) [*R.A.M.*, vi, p. 627], and, for its control, recommends spraying the trees with 1 per cent. Bordeaux mixture in the latter part of May and early in July.

NICOLAS (G.) & AGGÉRY (Mlle). **Un nouveau parasite d'Eriobotrya japonica Lindl.** [A new parasite of *Eriobotrya japonica* Lindl.]—*Rev. Path. Vég. et Ent. Agric.*, xv, 4–5, pp. 102–105, 3 figs., 1928.

On round, reddish-brown, scattered lesions, 3 to 30 mm. in

diameter, on the leaves of a loquat (*Eriobotrya japonica*) tree growing at Toulouse, the authors observed a fungus [the morphological characters of which are described and figured] with amphigenous, flattened pycnidia, the upper part of which was thickened and stromatic, and which measured 235 to 400 μ in breadth and 70 to 155 μ deep. The filamentous, simple sterigmata, 11·5 to 25 μ long, were each terminated by a hyaline, fusiform, non-septate spore, which generally contained 2, rarely 3 or 4, oil drops. and measured 7·5 to 11·5 by 1·7 to 2·3 μ. These spores were discharged through a crack in the thickened pycnidial wall.

Although the fungus bears some affinity to *Phyllosticta ambiguella* Sacc. in the shape of the spores and the length of the sterigmata, the authors regard it as a new species of this genus and name it *P. fusiformis*, a Latin diagnosis being appended. It is believed to be a weak parasite.

WAGLE (P. V.). **Studies in the shedding of Mango flowers and fruits, Part I.**—*Mem. Dept. Agric. India*, Bot. Ser., xv, 8, pp. 219–249, 5 pl., 1928.

In connexion with an investigation of the shedding of mango flowers and fruits in certain districts of the Bombay Presidency, the writer describes the flower mildew caused by *Erysiphe cichoracearum*, and gives notes on his experiments in its control [*R.A.M.*, iv, p. 465].

The spores blown from an infected area readily adhere to the hairy, unopened flowers near the tip of the inflorescence and germinate in five to seven hours. The mycelium develops in two days and produces a brown discoloration of the epidermal cells. The conidiophores of the fungus appear on the fourth day, and on the fifth the oval, mature spores are produced in such numbers that the whole of the affected surface assumes the characteristic powdery aspect. On the tender vegetative shoots the life-cycle from spore to spore is somewhat longer (nine days).

It was shown by detailed observations in 1926–7 that mildew affects the flowers before fertilization and the fruits in their earliest stages (before reaching 0·4 cm. in diameter). Heavy losses may be caused at these times. The data obtained in a series of inoculation experiments showed that the mildew alone is capable of entirely destroying the crop.

An investigation of the effects of spraying against the mildew showed that the application of 5–5–50 Bordeaux increased the number of healthy ripe fruits per 100 complete flowers from 0·77 to 0·93 per cent. (or by 21 per cent.) in 1925–6, and from 0·12 to 0·40 per cent. (or by about 230 per cent.) in 1926–7.

HORNE (W. T.). **Note on the experimental inoculation of Avocado seedlings with the Pear blight organism, Bacillus amylovorus (Burr.) Trev.**—*Plant Disease Reporter*, xii, i, pp. 7–8, 1928.

Avocado (*Persea americana* and *P. drymifolia*) seedlings (probably of Guatemalan type) were inoculated with the pear blight organism (*Bacillus amylovorus*) at the University of California

with negative results on three separate occasions in 1927–8. Comparative inoculations on pear were successful in every case. The experiments were conducted under favourable conditions for infection, the inoculated tissues of the avocados being succulent and in active growth.

Barker (B. T. P.). **Investigations on the fungicidal action of sulphur. Progress report.**—*Ann. Rept. Agric. & Hort. Res. Stat., Long Ashton, Bristol, for 1927*, pp. 72–80, [1928].

Investigations conducted since 1919 at Long Ashton, Bristol, have indicated that sulphur gives off minute solid particles which under appropriate conditions appear to emanate from the parent mass continuously (*Long Ashton Report*, 1919, and *Ann. Appl. Biol.*, xiii, 2, p. 308, 1926) and the action of the sulphur against parasitic fungi in greenhouses was accounted for by this particulate sulphur [*R.A.M.*, i, p. 437]. In this progress report, further results are recorded regarding the interaction between sulphur and the plant, and between sulphur and the fungus.

Pots of young strawberry plants just beginning to throw up the young foliage were dusted with sulphur, and tests were made for sulphuretted hydrogen by clamping the leaves between layers of moist lead acetate paper. The youngest leaves gave an intense brownish-black stain on the paper next to the under surface of the leaf. Older leaves showed a definite weakening of the reaction, which decreased progressively with the age of the leaf, until finally, with the approach of the dormant season, it did not occur. Repeated tests showed that before any clear reaction can be obtained the plants must have passed from the dormant winter condition into active renewed growth. The reaction occurs only on the under surface of the strawberry leaf, and the presence of stomata appears to be necessary for it. It is equally vigorous whether the test is made in light or darkness, and is also freely given by plants that have been previously kept in darkness for some days. To secure the reaction the tested leaves must remain attached to the parent plant, or, if detached, the petioles must be cut under water. Similar results were also obtained with Gramineae, Rosaceae, and Ribesiaceae. No fact was observed suggesting that the reaction with lead acetate was due to any substance other than sulphuretted hydrogen.

To eliminate any possible effect of the direct contact between the lead acetate and the leaf or sulphur, other experiments were carried out in which the sulphured leaf was enclosed in a shallow glass chamber, provided with a small opening which was covered with a cellulose pad sufficient to filter the particles of sulphur. Lead arsenate paper placed on this opening showed the characteristic blackening. When a hanging drop containing conidia of *Monilia* [*Sclerotinia*] *fructigena* was placed over the opening, germination of the conidia was prevented and death resulted, thereby proving the toxicity of the gaseous sulphur product to the fungus.

Experiments conducted at the Station by R. W. Marsh are stated to have demonstrated the highly fungicidal action of sulphuretted hydrogen, and to have established that the quantity formed by

living leaves under the conditions described above is sufficient to be definitely toxic.

Cultures of fungus mycelium grown in bulk and lightly dusted with various forms of sulphur also gave the sulphuretted hydrogen reaction. Control tests with unsulphured mycelium and leaves gave negative results, and it is considered that sulphuretted hydrogen is produced as a direct result of the interaction between the living fungus or leaf and the sulphur.

In conclusion, the author briefly touches upon two points in which he cannot accept Young's hypothesis [ibid., ii, p. 460; vii, p. 335] that the toxicity of sulphur is due to pentathionic acid; at Long Ashton the toxic effects of sulphur were secured at P_H values outside the range of this acid (P_H 4·2 to 5·4) and, further, sulphuretted hydrogen must come into account once more as one of the toxic products of sulphur, if not indeed the only one.

PARKER (T.). **Sulphur. Its use in horticulture.**—*Fertilizer, Feeding Stuffs and Farm Supplies Journ.*, xiii, 7, pp. 225–227, 2 figs., 1928.

In this popular discussion, the author recommends that lime-sulphur solution should be bought on a basis of polysulphide content and not on the specific gravity, as this can be raised by means of soluble adulterants. Green sulphur, obtained from the purification of coal gas [cf. *R.A.M.*, iv, p. 461], is said to have an extended use in Britain under glass but its efficiency is considered to be much inferior to a good quality dusting powder. Sulphur has a tendency to 'ball' and to stick in the machine, owing to electrification of the particles [ibid., vii, p. 40] but, by the use of spreaders, this defect can be neutralized. The author gives details of comparative tests of flowers of sulphur and other grades of sulphur with two special sulphur dusts, the results of which indicate the superiority of the latter both in sieving, adhesion, floating capacity, and sedimentation tests. [The data on the dusting sulphurs are reproduced, with a summary of the discussion on their use, in *Gard. Chron.*, lxxxiii, 2154, pp. 252–253, 2 figs., 1928.]

HOLLAND (E. B.) & GILLIGAN (G. M.). **Electrolytic apparatus for the determination of copper in insecticides and fungicides.**—*Indus. & Engin. Chem.*, xx, 5, p. 533, 1 diag., 1928.

A brief technical description is given of an apparatus with fixed electrodes, which has recently been installed by the Massachusetts Experiment Station for the quantitative determination of copper in insecticides and fungicides.

BARKHOFF (A.). **Aus den Beizversuchen 1927 der Landwirtschaftlichen Schule Hohenhausen-Lippe.** [Notes on the 1927 disinfection experiments at the Hohenhausen-Lippe Agricultural College.]—*Nachricht. über Schädlingsbekämpf.*, iii, 1, pp. 6–10, 1928.

Excellent control of *Fusarium* disease of rye [*Calonectria graminicola*] was given by dusting with tillantin or tillantin R, the

former being particularly effective and increasing the yield by 63 per cent. Loose smut of oats (*Ustilago avenae*) was eliminated by treatment with hafertillantin, tillantin, and an unnamed preparation, and reduced to a trace by tillantin R. The disinfection of beet seed against root rot [*Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*] with tillantin and tillantin R resulted in a considerable increase of yield. In one case part of a plot treated with tillantin showed intensely heavy infection, while the remainder was quite healthy; this is attributed to the acid reaction of the soil in the former (P_H 4·9 compared with 6·6) [*R.A.M.*, vii, p. 3].

MORSTATT (H.). **Bibliographie der Pflanzenschutzliteratur: das Jahr 1927.** [Bibliography of plant protection literature for the year 1927.]—*Biol. Reichsanst. für Land- und Forstwirtsch.*, Berlin-Dahlem, 250 pp., 1928.

This bibliography of German and foreign literature on various aspects of plant protection has been prepared on the lines adopted in former years [*R.A.M.*, vi, p. 678].

SCHLUMBERGER (O.). **Pflanzenschutz auf wirtschaftlicher Grundlage.** [Plant protection on an economic basis.]—*Deutsche Landw. Presse*, lv, 15, pp. 217–218; 17, pp. 253–254, 1928.

Some suggestions are here outlined for the reconstitution of the German plant protection regulations on an economic basis. Prerequisite conditions for the rationalization of the present methods of disease control include (1) an accurate estimate of the direct and indirect injury caused by certain plant diseases to individuals and to the community; (2) an economic study of plant protection by means of experiments conducted on an industrial or economic basis, necessitating the calculation of net profits with reference to the outlay of capital and labour and to harvest prices; (3) the adaptation of practical measures to the varying local agricultural conditions; and (4) the restriction of control to economically important diseases and the reduction in price of the necessary requisites.

The future development of plant protection along these lines is discussed at some length, with illustrations from concrete examples of various important diseases. Emphasis is laid on the urgent necessity for more extensive experimentation in the field, and for the adjustment of the various control measures in such a way as not unduly to disorganize normal agricultural operations. In conclusion some observations are made on the possibility of compensation for the losses arising out of various diseases by means of insurance [cf. *R.A.M.*, vi, p. 430].

VERPLANCKE (G.). **Quelques données nouvelles sur les maladies à virus filtrants.** [Some new data on the diseases due to filterable viruses.]—*Ann. de Gembloux*, xxxiv, 4, pp. 121–135, 1928.

Some of the more important contemporary papers on the virus diseases of plants are reviewed and briefly discussed. Costantin's

theory regarding the beneficial effect of high altitudes in preserving or restoring the health of various crops [*R.A.M.*, vii, p. 403] is not confirmed by the author's observations in Belgium, where virus diseases, e. g., of potatoes, are equally rife in the Ardennes (average height 400 to 500 m. above sea-level) and in the plains. Rigorous roguing of the seed plants is considered to be the sole efficacious means of producing healthy potato crops in low-lying regions. The so-called 'tuber testing method' advocated by Blodgett and Fernow (*Phytopath.*, xi, p. 58, 1921) has given very unreliable results in recent experiments at Gembloux.

A bibliography of 76 titles is appended.

VAN DER MEULEN (J. G. J.). **Voorloopig onderzoek naar de specialisatie en de infectiebronnen der mosaiekziekten van landbouwgewassen.** [Preliminary investigation on the specialization and sources of infection of the mosaic diseases of agricultural crops.]—*Tijdschr. over Plantenziekten*, xxxiv, 5, pp. 155–176, 1928.

In this paper (to which an introduction is contributed by Dr. H. M. Quanjer), the writer describes his extensive investigations, conducted during 1925–6, on the inter-transmissibility of the mosaic diseases of various agricultural crops.

The results of the cross-inoculation experiments [full particulars of which are given] show that, in general, the mosaic diseases are very strictly specialized on their respective hosts. Negative results were given by all attempts at the inter-transmission of beet mosaic to potatoes and spinach [but see *R.A.M.*, vii, p. 136]; of kohlrabi [*Brassica oleracea* var. *caulo-rapa*] mosaic to potato and vice versa; of *B. napus* var. *oleifera* mosaic to potato; of potato mosaic to beet; to *Vicia faba* var. *major* and vice versa; to mustard (*Sinapis* [*Brassica*] *alba*) and vice versa; to *Rumex domesticus* and *R. crispus* and vice versa; to *Tussilago farfara*; and to *Polygonum persicaria*. The insect vector used in all these tests was *Myzus persicae* [ibid., vii, p. 48], while in the beet and most of the potato experiments *Macrosiphum ulmariae* was also employed.

On the other hand, positive results were obtained in an experiment in the transmission of white clover (*Trifolium repens*) mosaic to potatoes through *Aphis rhamni* but not through *M. persicae*, and probably this mosaic can also be transmitted to red clover by *M. persicae, A. rhamni*, and *Macrosiphum pisi*. It was also indicated that the mosaic occurring on *Solanum nigrum* is distinct from that of the edible potato, and that these two diseases are inter-transmissible by means of *M. persicae*.

Aphis fabae [*A. rumicis*: ibid., vii, p. 135] was found to play no part in the inter-transmission of mosaic between *V. faba* vars. *major* and *minor*, or in the transmission of the disease from *Phaseolus nanus* to these varieties of *Vicia*. *Rhopalosiphum fabae* was shown to transmit mosaic from *V. faba* var. *major* to the same host, and probably also from *V. faba* var. *major* to *V. faba* [loc. cit.]. Mosaic of both *V. faba* var. *major* and *P. nanus* was found to be transmissible by the seed, but this was not the case with mosaic of beet, kohlrabi, pea, *T. incarnatum*, or *S. nigrum*. Neither *R. pisi* nor

A. fabae was effectual in transmitting mosaic from diseased to healthy peas.

BÖNING (K.). **Beiträge zum Studium der Infektionsvorgänge pflanzlicher Viruskrankheiten. I. Mitteilung.** [Contributions to the study of the infection processes of the virus diseases of plants. Part I.]—*Zeitschr. für Parasitenkunde*, i, 1, pp. 198–230, 2 figs., 2 diags., 1928.

In connexion with a survey of the principal literature on the virus diseases of plants, the writer describes the technique and results of a series of experiments designed primarily to ascertain the rate of spread in inoculated plants of tobacco and tomato mosaic and tomato streak [*R.A.M.*, vii, p. 281].

The tests were carried out on seedlings with six to seven leaves, the largest of which was inoculated at the tip. The rate of spread of the virus was determined (*a*) by severing the inoculated leaf from the plant at regular intervals and noting the subsequent condition of the seedling; and (*b*) by cutting the severed leaves into sections, each of which served as inoculum for healthy plants in the same stage of development. The experiments were further varied by withholding nitrogen from one lot of plants while the others received the normal supply. At least four plants were used in each series.

The rate of spread of the mosaic virus was found to be more rapid in tobacco than in tomato (two compared with three days for a minimum length of 13 cm. of leaf). Tomato streak spread more slowly, a minimum of four days being required in the same length of leaf as the last. In tomato stems the mosaic virus took four or five days to traverse a distance of 20 cm. against the sap stream, while in the opposite direction a distance of 25 cm. was traversed in the same period. The streak virus traversed a distance of 20 cm. in five to six days against the sap stream, and 25 cm. in five days with it.

Assuming the propagation period of the disease to terminate with the time when the virus reaches the growing point of the stem and penetrates the petioles, the duration of this period for tobacco mosaic is four to five days and for tomato mosaic at least six. Approximately one more day must be added for tomato streak. The period of latency, after the virus is diffused, but before symptoms appear, for tobacco mosaic is one to two days, for tomato mosaic six to eight days, and for tomato streak one day longer.

The absence of nitrogen was found to delay the rate of spread of the viruses used in these experiments, and in the case of tomato streak the symptoms of infection were less severe [cf. ibid., vi, p. 571]. The labile character of streak, as expressed in its susceptibility to environmental conditions, is attributed to its origin as a combination of viruses.

The streak components are more inclined to masking than the mosaic elements, and in some cases the symptoms of this disease resemble those obtained by the transmission of potato mosaic to tomatoes. Although no direct causal connexion has yet been traced,

it appears possible that this virus constitutes the second component of streak.

Dufrénoy (J.). **Condition d'hypotonie des cellules affectées par la mosaïque.** [Hypotonic condition of cells affected by mosaic.] —*Comptes rendus Soc. de Biol.*, xcviii, 17, pp. 1499–1500, 2 figs., 1928.

The cytological examination of epidermal fragments of mosaic-infected leaves shows a vesicular modification of the plastids and mitochondria of the diseased areas. The staining of the vacuoles by neutral red is very irregular in the discoloured areas as compared with the healthy ones. Tests showed that the cells of the mosaic tissues are in a hypotonic condition.

Frobisher (M.). **On the action of bacteriophage in producing filtrable forms and mutations of bacteria.**—*Journ. Infect. Dis.*, xlii, 5, pp. 461–472, 1928.

An attempt was made to confirm the statements of various workers [reference to whose work is given] that ultrabacteria, or filterable, mutant forms of bacteria are produced by the action of the bacteriophage. Fifty-nine flasks of bacteriophage filtrate of six different races of bacteriophage of varying potency were prepared and distributed among 645 sterile tubes. Of these 8·5 per cent. showed secondary growths, while of 488 tubes of filtered sterile broth identically prepared as a control, growths developed in 8·8 per cent. Many of the growths found in the sterile broth filtrates were shown to be identical with environmental bacteria, and also with some of the secondary growths in the tubes of bacteriophage filtrate. The secondary growths therefore appear to develop, not necessarily as a result of the action of bacteriophage, but also following the processes of filtering and pipetting sterile material.

Further improvements in technique effected a considerable reduction in the development of secondary growths and in every case in which they appeared they were either due to obscure defects in the filters or were common environmental organisms.

It is concluded that none of these growths could be considered to be the result of the action of the bacteriophage, all being explicable on the basis of contamination.

Schaffnit (E.). **Über das Spezialisierungsproblem bei parasitischen Pilzen.** [On the specialization problem in parasitic fungi.]—*Angew. Bot.*, x, 2, pp. 170–177, 1928.

The problem of physiological specialization in parasitic fungi is discussed with reference to earlier and contemporary literature. The more recent papers mentioned have been noticed in this *Review*.

Stevens (F. L.). **The sexual stage of fungi induced by ultraviolet rays.**—*Science*, N.S., lxvii, 1742, pp. 514–515, 1 fig., 1928.

On 29th January, 1928, immense numbers of perithecia of *Glomerella cingulata* appeared on certain portions of agar plate

cultures which had been exposed on the 25th to the ultra-violet rays from a Cooper Hewitt quartz mercury arc. The culture was one of several monosporous strains of the bitter rot fungus isolated in the previous October from diseased apples, all of which gave a similar response. The perithecia developing under the influence of the rays differ from those formed naturally in being spherical and non-stromatic, but the asci and spores are exactly the same as those produced normally. No perithecia developed in untreated cultures, or in the parts of the colony shaded from the rays by cardboard. Pycnidial production in a species of *Coniothyrium* was also greatly accelerated by radiation.

FREAR (D.), STYER (J. F.), & HALEY (D. E.). **A study of the effect of H-ion concentration on the growth of Agaricus campestris.**—*Plant Physiol.*, iii, 1, pp. 91–94, 1 graph, 1928.

On a synthetic medium [the composition of which is indicated] the best growth of *Agaricus* [*Psalliota*] *campestris* was obtained at P_H 6·0. The cultures in which growth was most profuse changed the reaction of the medium to a marked extent (from P_H 6·0 to 8·0, 6·3 to 7·4, 6·7 to 7·4, and 7·0 to 5·0 after four weeks in four separate cultures).

SIDERIS (C. P.). **Similarity between physicochemical and biological reactions.**—*Plant Physiol.*, iii, 1, pp. 79–83, 1928.

From a study of the growth behaviour of fungi on pineapple protein *A* it was found that *Fusarium martii*, *Verticillium* sp., and *Penicillium* sp. make no growth in isoelectric solution (P_H 6·4). *F. martii* may grow in solutions of this protein having a P_H value above that of the isoelectric point (7·3 to 11·05 with a maximum at 9·45 to 9·90). *Verticillium* sp., on the other hand, grows only in solutions with P_H values below the isoelectric point (2·63 to 5·32, maximum 3·33), while *Penicillium* sp. develops equally well both above and below the critical degree (maximum 3 to 3·33 below and 8·65 to 9·45 above). Protein as such is stated not to be available to a fungus. The author attempts to explain the breaking down of the protein *A* by the enzyme released by the organisms on a physico-chemical basis, taking into consideration the constitution of the protein at ranges above and below the isoelectric point.

SMITH (K. M.). **Insects and Potato virus diseases.**—*Nature*, cxxi, 3058, p. 904, 1 fig., 1928.

The writer's extensive experiments at Cambridge are stated to show conclusively that leaf roll of potatoes is normally transmitted by the aphid, *Myzus persicae* [see above, p. 658], which attacks both the plants in the field and the sprouts of stored tubers. Under certain conditions 90 to 100 per cent. of the experimental plants regularly developed leaf roll through the agency of this insect. It has further been proved, under greenhouse conditions, that healthy potatoes, on the sprouts of which viruliferous individuals of *M. persicae* have been feeding, will produce such badly rolled plants, within two months of the date of the first infection, as to give little or no yield. Attempts to induce nine other species of normal

potato insect fauna to transmit leaf roll have so far given negative results.

As regards mosaic, the transmitting power of *M. persicae* appears to be much slighter, and the percentage of successful experimental results has been low. It was found, however, in this connexion, that the inoculation (by leaf mutilation and rubbing with infected foliage) of tobacco plants with the mosaic virus from Arran Victory potato foliage, produced the characteristic symptoms of ring spot [*R.A.M.*, vii, p. 408].

On retransferring this virus by needle inoculation to healthy potatoes, an intensely severe and infectious form of mosaic is produced. The leaves become much mottled, crinkled at the edges, and covered with small necrotic spots. These symptoms resemble those of crinkle [ibid., iii, p. 415 *et passim*], the latter, however, being very much less infectious. This altered virus can be passed by needle inoculation from potato to potato and tobacco, and from tobacco to tobacco and potato with the utmost regularity, the symptoms developing in the potato in 8 to 11 days and in tobacco after a somewhat longer period.

M. persicae may be induced to transmit this transformed or 'ring spot' mosaic to potatoes in periods from 14 to 24 days. Inoculations into healthy potatoes with the juice of healthy potatoes or with viruses other than mosaic have hitherto failed to produce ring spot, which develops, however, when mosaic forms a component part of the virus complex.

REILING (H.). **Einige neuere Virus-Krankheitsformen.** [Some recent types of virus disease.]—*Deutsche Landw. Presse*, lv, 15, p. 219, 5 figs., 1928.

A brief, popular account is given of stipple-streak disease of potatoes [*R.A.M.*, vi, p. 115]. Mention is also made of the potato condition known in Holland as 'raspberry leaf', characterized by stunted growth, and soft, drooping, glistening foliage.

GOSS (R. W.). **Transmission of Potato spindle-tuber by grasshoppers (Locustidae).**—*Phytopath.*, xviii, 5, pp. 445–448, 1928.

This is an expanded account of the author's experiments in the transmission of potato spindle tuber by grasshoppers (*Melanoplus* spp.), a preliminary note on which has already appeared [*R.A.M.*, vii, p. 463].

GILBERT (A. H.). **Production of Potato tuber necrosis.**—*Science*, N.S., lxvii, 1740, pp. 464–465, 1928.

During 1926–7 the writer carried out a series of investigations (chiefly cytological and histological) at the University of Wisconsin to elucidate the relationship existing between leaf roll and net necrosis of Irish potatoes. Plants were grown in the field under controlled conditions from healthy and leaf roll tubers, and aphids of the species *Myzus persicae* were colonized on diseased plants in cages and transferred in batches of 25 to 50 to the foliage of healthy ones.

At the first examination of the harvested tubers from these cages on 25th October, abundant necrosis, of the phloem-necrosis

type, was found in all the treated cages, while the controls in cages kept free from the aphids and from other insects were quite healthy. The necrosis was in the early stage of development and did not extend far from the stem end of the tubers or produce extreme discoloration.

This is believed to be the first instance of the production of net necrosis under controlled conditions, and the first proof of a hypothesis advanced by Schultz and Folsom in 1921, to the effect that net necrosis and leaf roll are due to an identical virus [cf. *R.A.M.*, vii, p. 111].

YOUNG (P. A.). **Transmission of Potato witches' broom to Tomatoes and Potatoes. (Preliminary report.)**—*Science*, N.S., lxvi, 1709, pp. 304–306, 1927.

Eighteen Earliana tomato plants were inarch-grafted in the greenhouse on to potato plants severely affected with witches' broom [*R.A.M.*, vi, p. 746], and within 73 days nine showed symptoms of the disease, while fifteen ungrafted controls remained unaffected.

The symptoms on the tomato were as follows. The new leaflets had yellow, chlorotic margins, and were much dwarfed, some being rugose; many had very narrow leaf blades. The lower sides of the veins of a few leaflets were purple and many of the rhachides were curled downwards. The new tops were very chlorotic, bloomed profusely, and produced numerous small tomatoes. This is thought to be the first report of the transmission of the virus of potato witches' broom to a different host.

Plug inoculations from affected potato tubers to 138 seed pieces of rogued stocks resulted in 45 of the plants developing witches' broom. The susceptible varieties included Bliss Triumph, Green Mountain, Irish Cobbler, Russet Burbank, and Rural New Yorker, though the two last-named did not show marginal chlorosis of the leaflets.

Numerous plug inoculations with scions from healthy tubers all gave negative results, while of some 4,000 uninoculated potato plants only one developed the disease, though the progeny of hundreds of tubers produced by diseased plants were, with a single exception, all infected.

Attempts to transmit the disease by leaf mutilation inoculations and by the agency of mealy bugs and coccids also failed.

In the greenhouse the symptoms develop after 31 to 114 days. The earliest symptom of witches' broom is an increasing chlorosis of the new leaflets, especially of the margins, while the top of the plant rapidly becomes elongated, producing a cylindrical, chlorotic, often purpled stem with enlarged nodes. Many chlorotic, spindly, axillary branches develop along the stem, bearing typical witches' broom leaves. Filamentous aerial stems are often numerous and are valuable in diagnosis. Spindly sprouts appear at the base of the plant, and grow very slowly; they represent the severe form of the disease. The tubers already formed often sprout, adding to the number of spindly basal sprouts. Vigorous plants may have more than 200 very slender stems and numerous very small tubers. Affected plants may attain a height of 1 m. and frequently bloom

earlier and more profusely than normal plants. The dwarfed, new branches often bear only minute, simple leaves, while aerial tubers frequently occur on all parts of the plant. Finally, the main stems die, leaving spindly basal sprouts 5 to 30 cm. high, which may live several months longer, to be replaced by new sprouts and branches.

Bonde (R.). **The transmission of Potato black-leg by the seed Corn maggot in Maine.**—*Phytopath.*, xviii, 5, p. 459, 1928.

Leach's experiments having shown that blackleg of potatoes [*Bacillus atrosepticus*] is transmissible by the seedcorn maggot (*Hylemyia* [*Phorbia*] *cilicrura*) [*R.A.M.*, v, p. 573], similar observations on this phenomenon were made in Aroostook County, Maine. Experimental evidence was obtained of the capacity of flies, taken from an infected field, to transmit the disease to disinfected seed pieces, the maggots burrowing into the tubers and producing a rot which sometimes destroyed the seed-piece before any plants were produced, while those which did develop were all infected. Collections of maggots from the soil beneath blackleg plants caused a similar rotting of the seed-pieces. *P. cilicrura* is evidently a factor to be considered in the control of potato blackleg in Maine.

Köck (G.). **Ein Versuch zur Vernichtung des Kartoffelkrebses durch Bodendesinfektion.** [An experiment in the destruction of Potato wart through soil disinfection.]—*Oesterr. Zeitschr. für Kartoffelbau, 1927*, 3, pp. 12–13, 1927.

In the autumn of 1925 wart disease of potatoes [*Synchytrium endobioticum*] was detected at Sankt Anton (Vorarlberg), and in 1927 infection was again observed on a small plot in the original field (now used as meadowland), showing that the fungus had remained viable in the soil during the interval. Other plots were treated shortly before planting with 1 per cent. formalin or 0·5 per cent. uspulun at the rate of 50 l. per 20 sq. m. The potatoes (Alma and Wohltmann) on the treated plots developed satisfactorily and remained free from wart disease.

De Aardappelziekte (Phytophthora infestans de Bary). [The Potato disease (*Phytophthora infestans* de Bary).]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 52, 16 pp., 1928.

This is a popular account, based on recent investigations, of the symptoms and effects of late blight of potatoes (*Phytophthora infestans*) in Holland, with observations on varietal susceptibility, control measures, and the influence of meteorological conditions on the incidence of infection [see next abstract].

Van Poeteren (N.). **Een waarschuwingsdienst voor het optreden van de Aardappelziekte.** [A cautionary service in connexion with the occurrence of the Potato disease.]—*Versl. en Meded. Plantenziektenkundigen Dienst te Wageningen*, 53, 8 pp., 2 graphs, 1928.

The data obtained in response to questionnaires circulated by the

Dutch Phytopathological Service in 1926 and 1927 generally confirmed van Everdingen's conclusions regarding the influence of weather conditions on the incidence of late blight of potatoes (*Phytophthora infestans*) [*R.A.M.*, v, p. 627]. Arrangements have accordingly been made for the Royal Dutch Meteorological Institute at Te Bilt and its special observatories in the potato-growing districts to issue warning notices whenever conditions are such as to justify the expectation of an early outbreak of the disease. These reports will be broadcasted with the ordinary weather reports issued at 10.45, 11.50, 12.55, and 9 o'clock, and will also be circulated in the daily papers and communicated to agriculturists by the Phytopathological Service.

MÜLLER (K. O.). **Untersuchungen über die Kartoffelkrautfäule und die Biologie ihres Erregers.** [Investigations on Potato blight and the biology of its causal organism.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xvi, 1, pp. 197–211, 1 graph, 1928.

Continuing his investigations on potato blight (*Phytophthora infestans*) [*R.A.M.*, v, p. 687], the writer prepared cultures of the fungus from material received from twelve different sources, and tested their virulence towards four commercial potato varieties and two of his own selections. The resulting data [which are tabulated] showed that both the selections (EF 21 xii, 2 × Polanin) 232 and 302, were highly resistant to inoculation with all the cultures, whereas the commercial varieties Industrie, Kuckuck, Wohltmann, and Roode Star were all more or less susceptible. Only in the last-named could any appreciable difference in the effects of the cultures from the various sources be detected.

A study of the morphological characters of the sporangia in the different cultures of *P. infestans* revealed the existence of comparatively slight dimensional variations, which are, however, considered sufficient to justify their classification as biotypes, presumably arising as an outcome of mutation [cf. ibid., vi, pp. 189, 509].

SZYMANEK (J.). **Quelques observations nouvelles sur le mildiou de la Pomme de terre.** [New observations on Potato mildew.]—*Rev. Path. Vég. et Ent. Agric.*, xv, 4–5, pp. 108–109, 1928.

Some notes are given on the author's study of the morphology and biology of *Phytophthora infestans* in potato tubers [*R.A.M.*, vii, p. 391].

VIELWERTH (V.). **Nepovšímnuta choroba Zemiakov.** [An unheeded disease of Potatoes.]—*Ochrana Rostlin*, viii, 2–3, pp. 56–58, 1 fig., 1928.

Common scab [scurf] of potato (*Rhizoctonia* [*Corticium*] *solani*) is stated to be widespread in Czecho-Slovakia, chiefly owing to the fact that little attention is paid to it by the local growers because it causes no great injury to tubers used for industrial purposes or

as cattle food. The real danger of the disease is that infected seed-tubers may either fail entirely to germinate, or give rise to very depleted stands of sickly plants that die before producing a crop. The necessity is, therefore, stressed of obtaining healthy seed tubers or else of disinfecting those that are attacked. Good results in this treatment were obtained by steeping the tubers for 6 hours in a 0·25 per cent. solution of formalin, for $1\frac{1}{2}$ hours in 0·1 per cent. solution of mercuric chloride, or for half-an-hour in a 1·5 per cent. solution of uspulun. It was noticed that excessive nitrogenous manuring enhanced the severity and frequency of the disease in the field.

As regards varietal resistance of potatoes to *R. solani*. the following notes were made in 1927: on a soil uniformly infected with the organism, the variety Wohltmann showed 8 per cent., Arnika 18 per cent., Beseler and Pirola 12 per cent., Laurus 26 per cent., Centifolia 40 per cent., and Pepo 54 per cent. infection.

ORTON (C. R.) & MILES (G. F.). **Seed Potato treatments in 1927.**—*Amer. Potato Journ.*, v, 5, pp. 131–136, 1928.

The results of extensive experiments in potato-growing States showed that dip dust, an organic mercury compound manufactured by the Bayer Co., Inc., is generally as effective as formaldehyde or corrosive sublimate in the control of scab [*Actinomyces scabies*], but is not quite as efficacious against *Rhizoctonia* [*Corticium solani*], as $1\frac{1}{2}$ hours' immersion in corrosive sublimate [*R.A.M.*, vii, p. 263].

MOORE (H. C.) & WHEELER (E. J.). **Seed treatment experiment in Michigan.**—*Amer. Potato Journ.*, v, 4, pp. 100–103, 1928.

During 1927 Bayer dip dust, semesan bel, and other organic mercury seed disinfectants were compared with corrosive sublimate for the control of scab [*Actinomyces scabies*] and black scurf [*Corticium solani*] in two localities in Michigan [see preceding abstract]. None of the organic mercury compounds was as effective as corrosive sublimate in the control of *C. solani*, and only 21 bel (at the rates of 1 in 15 and 1 in 20) was equal to it in the prevention of scab.

BLODGETT (F. M.). **A preliminary experiment using calomel as a dip treatment of seed Potatoes.**—*Amer. Potato Journ.*, v, 1, pp. 6–12, 1928.

A preliminary field experiment was conducted at Ithaca, New York, to test the value of mercurous chloride (1 in 10) [*R.A.M.*, vi, p. 489] in comparison with hot mercuric chloride (1 in 1,000, 4 minutes) and semesan bel dip (1 in 10) for the control of potato *Rhizoctonia* [*Corticium solani*: see preceding abstracts]. A laboratory test indicated that hot mercuric chloride absolutely destroys the sclerotia of the fungus, while semesan bel and mercurous chloride almost inhibit their growth. The average increase of the yield of the treated plots ranged from 22 to 37 bushels per acre, but the differences between the results given by the three treatments were not significant.

ŘÍHA (J.). **O velikosti znižovani sklizně a převodních koefficientech u našich nejdůležitějších chorob Bramborových.** [Correlation coefficients for estimating the reduction in yield caused by the more important of our Potato diseases.]—*Ochrana Rostlin*, viii, 2-3, pp. 58–61, 1928. [German summary.]

In this brief note the author points out the economic advantages which would accrue if correlation coefficients could be established to estimate in advance the relative reduction in yields caused by the more important potato diseases, and also the difficulties presented by this problem. Many years of observation in the field and in experimental plots have shown that, under the conditions prevalent in the Czecho-Moravian highlands, potato leaf roll must be recognized as the most destructive, since the average reduction in yield caused by it is over 80 per cent. If this reduction is taken as a unit, it would require, to produce an equal amount of damage, 1·5 times as much bacterial ring disease [*Bacterium solanacearum*] and blackleg [*Bacillus atrosepticus*], twice as much *Phytophthora* [*infestans*], 3·75 mosaic, and 4 *Rhizoctonia* [*Corticium solani*].

KÖHLER (E.). **Zur Kenntnis von Phoma solanicola Prill. et Del.** [Contribution to the knowledge of *Phoma solanicola* Prill. et Del.]—*Angew. Bot.*, x, 2, pp. 113–139, 9 figs., 1928.

In July, 1925, *Phoma solanicola* Prill. et Del. was isolated from diseased stalks of Böhm's Heimat potatoes at the Biologische Reichsanstalt, Dahlem, Berlin. The fungus produces extensive brown lesions on the stalks, the interior of which dries up, becomes filled with air, and turns whitish so that the brown colour of the lesion is eventually confined to its margin. The olive-brown pycnidia are at first immersed but later many become superficial. In severe attacks the stalks bend over or break at the affected part and may ultimately be killed. Inoculation experiments with pure cultures of the organism on potato stalks in the greenhouse have hitherto given negative results, but its pathogenicity is rendered highly probable by the well-defined specialization of the fungus on certain varieties; by the parasitic appearance of its attack in nature on perfectly healthy, vigorous stalks; and by the fact that in other species of *Phoma*, e. g., *P. betae*, the success of inoculations depends on the hydrogen-ion concentration of the soil. The very rare occurrence of the disease suggests that the essential conditions for infection by *P. solanicola* are seldom realized.

The behaviour of the fungus on various nutrient media was investigated. Particularly good growth was made on maltose, and cultures on this medium produced an olive-green pigment which was deposited in the cell walls. Gelatine was liquefied by the organism. The number and dimensions of the pycnidia varied considerably with the quantity and quality of the medium. About five times as many pycnidia were produced in Petri dishes as on slides, the size ranging from 58·5 to 110·8 μ in the latter and from 75·1 to 172·4 μ in the former. The average dimensions of 960 pycnospores were $5{\cdot}99 \pm 0{\cdot}059$ by $2{\cdot}80 \pm 0{\cdot}033\ \mu$.

In slide cultures on salep agar certain hyphae at the margin may produce swollen, multicellular, vacuolate bodies, developing each on

a single hypha, and representing an attempt at pycnidium-formation. On other hyphae single round cells may be produced.

HEMMI (T.) & SETO (F.). **Experiments relating to stimulative action by the causal fungus of the 'bakanae' disease of Rice. (Preliminary report.)**—*Proc. Imper. Acad. (Tokyo)*, iv, 4, pp. 181–183, 2 figs., 1928.

The condition known as 'bakanae-byô' is one of the most destructive diseases of rice seedlings in Japan. The leaves and culms of infected plants grow abnormally long and slender, and later develop a yellowish-green or pale coloration. The disease is generally attributed to the presence in the basal tissues of a species of *Fusarium*, the ascigerous stage of which was described by Sawada (*Trans. Nat. Hist. Soc. Formosa*, 31, 1917) as *Lisea fujikuroi*. In order to determine the pathogenicity of the fungus in question isolations were made from the diseased basal tissues.

Most of the experiments yielded a species of *Fusarium* and the results of inoculation tests, using two methods [which are briefly described: cf. *R.A.M.*, vii, p. 54] proved beyond doubt that at least one strain of this fungus is capable of attacking perfectly healthy rice seedlings, causing the typical abnormal development referred to above.

In 1926 Kurosawa reported (*Trans. Nat. Hist. Soc. Formosa*, 87) that the abnormal growth of the affected seedlings is correlated with toxic excretions by the causal organism. In the writers' experiments the filtrate of cultures of a certain strain of the *Fusarium* grown in Knop's solution with glucose produced the characteristic 'bakanae' condition. Another strain of the same fungus isolated from diseased seedlings, as well as *Helminthosporium oryzae* [*R.A.M.*, vii, pp. 54, 55], failed to produce these symptoms. On the other hand, the filtrate of an unidentified *Fusarium* isolated from a scabbed seed produced on a healthy plant was also able to cause the 'bakanae' symptoms. Further investigations are necessary to determine the possible rôle of the metabolic products of the fungus in the acceleration of plant growth characteristic of the disease.

HEMMI (T.) & MATSUURA (I.). **Experiments relating to toxic action by the causal fungus of helminthosporiose of Rice. (Preliminary report.)**—*Proc. Imper. Acad. (Tokyo)*, iv, 4, pp. 185–187, 1928.

An outline is given of the results of the authors' experiments on the reaction of horse bean [(?) *Vicia faba*] cuttings to the filtrate of 30- to 85-day-old cultures of *Helminthosporium oryzae* [see preceding abstract] grown in Knop's solution with 5 per cent. cane sugar at 24° to 25° C. In most cases the cut shoots placed in the filtrates developed wilt symptoms considerably earlier (often in one or two hours) than the controls in distilled or tap water, or in the original solution. This phenomenon would appear to be due to the toxic excretions of the fungus or to certain toxic substances produced as the result of chemical changes in the medium.

In some cases the leaves of plants inserted in filtrates developed a large discoloured lesion, extending from the tip along the margin.

instead of showing any wilt symptoms. Such leaves were bordered with an indistinct blackish-brown zone, and clearly showed veins of the same colour in the lesion. When the same filtrate was heated, numerous circular, elliptical, or irregular, blackish-brown spots developed in a scattered form over the whole surface of the leaf blade. In another case the heated filtrate induced spotting within 24 hours, while the plants inserted in the non-heated filtrate showed no symptoms.

At a hydrogen-ion concentration of P_H 4·1 to 4·7 the medium became consistently more alkaline as a result of the growth of the fungus. However, this change in the reaction of the medium was apparently not directly responsible for the wilting and associated pathological phenomena. The characteristic wilting and spotting was observed in plants in filtrates adjusted to various concentrations between P_H 2·8 and 8·3. In one case the acidified filtrates (2·8 and 4·1) showed a tendency to produce lesions on the leaves, while the original solution or the same adjusted to slightly acid or alkaline reactions failed to do so. In one instance more severe symptoms occurred at the acid concentrations of the filtrate than at the alkaline ones.

PARK (M.). **Hevea stem disease caused by Fomes lamaoensis.**—*Trop. Agriculturist*, lxx, 4, pp. 225–226, 1928.

A brief description is given of a stem rot of two *Hevea* rubber trees in the Kalutara district of Ceylon, caused by *Fomes lamaoensis*. In both cases the fungus had gained an entry at some distance from the ground, and the subsequent ringing of the stems had caused the dying back of the crown of the tree. In one tree infection had evidently occurred through a cankered fork, and in the other it had probably started in the wood exposed by the removal of a lateral branch. The diseased wood was permeated by sheets of brown mycelium, and in advanced cases it was light and friable and of a honeycombed structure. The roots of both trees and sections of the trunks below the diseased portions were found to be entirely healthy. It is thought that the infection was caused by spores which reached exposed wood, and the necessity is therefore stressed of sustained attention to the estate practice of tree surgery and sanitation. Infected trees may be saved, in some cases, by cutting or pollarding them below the infected portion, but in every case the diseased parts should be burnt.

TUCKER (C. M.). **Vanilla root rot.**—*Journ. Agric. Res.*, xxxv, 12, pp. 1121–1136, 7 figs., 1927. [Received 1928.]

Commercial vanilla (*Vanilla*) [*planifolia*] is severely attacked in Porto Rico by a species of *Fusarium* [*R.A.M.*, vi, p. 599] which is believed to be a new variety (var. *vanillae*) of *F. batatatis*. This organism [an English diagnosis of which is given] differs from *F. batatatis* in its failure to produce blister-like sclerotia. *F. batatatis* is pathogenic to sweet potatoes and not to vanilla, while *F. batatatis* var. *vanillae* attacks vanilla and not sweet potatoes. It was observed in the course of inoculation experiments that severe infection followed any disturbance of the soil or mulch in which the roots were growing. Vanilla roots are succulent and liable to

injury, and cultivation under field conditions should be avoided. The shade and mulch should be sufficient to prevent the growth of grass and weeds round the roots.

STEINMANN (A.). **Over het optreden van een zwarte wortelschimmel (Xylaria apiculata) op Coca.** [On the occurrence of a black root fungus (*Xylaria apiculata*) on Coca.]—*Arch. voor Cacao Nederl.-Indië*, Deel 2, pp. 49–51, 4 pl., 1928. [English summary on p. 60.]

During June and July, 1926, the writer observed that some coca (*Erythroxylon coca*) plants on a cacao estate in Central Java were dying rapidly, especially in heavy shade. The roots and stem bases were covered with a black layer of fungus occurring in some parts in short, irregular strands and elsewhere in small, black hyphal masses. The fructifications detected on the stem bases near soil level were identified as those of *Xylaria apiculata* Cooke. They are coal-black, hard, brittle, cylindrical to clavate, and have the surface striated with fine, slightly raised lines. With the black, filiform stalk, measuring 2 to 10 by 0·5 to 1 mm., the dimensions of these fruit bodies are 1 to 2·5 cm. long by 2 mm. broad.

The black, oval to spherical, ostiolate perithecia measure 0·5 to 0·7 mm. in diameter and contain tubular, clavate, eight-spored asci, measuring 104 μ in length. The ascospores are oval, slightly curved, with rounded ends, and measure 11·5 to 15·5 by 2·8 μ.

Time did not permit of inoculation experiments, and it is therefore impossible to state definitely whether *X. apiculata* was parasitic or saprophytic on the affected trees. Petch (*Ann. Roy. Bot. Gard. Peradeniya*, viii, p. 124, 1924) records it as prevalent in Peradeniya on decaying timber, and it is possible that the affected coca trees in Java were originally weakened by some other cause. It should be remembered, however, that another species of the same genus, viz., *X. thwaitesii*, is known to cause root rot of coffee and rubber [*R.A.M.*, iv, p. 595; vi, p. 575].

The control of the disease should be based on the removal and destruction of the affected plants, accompanied by the application of aluminium sulphate or alum to the soil in order to raise the existing low exchange acidity (0·25 to 1·25).

BLATTNÝ (C.). **O methodách studia virusových chorob u Chmele.** [Methods for the study of virus diseases in Hops.]—*Ochrana Rostlin*, viii, 2–3, pp. 51–56, 3 figs., 1928. [French summary.]

After a brief reference to the various methods used for the study of the transmission of virus diseases in the hop, the author gives a concise description of a new method of grafting still dormant buds, or buds that have just started to swell but have not yet burst on to hop cuttings, preferably in the place from which a bud has been removed from the cutting. In his experiments in the spring of 1928 such grafts took from 10 to 12 days to unite at an average temperature of 18° to 20° C., and 14 to 20 days at 15° to 17°. He believes that, besides providing an easy means for studying the transmission of these diseases, this method may also present a practical interest to the growers in enabling them to graft desirable

varieties on less valuable stocks which may be more suitable for growing under particular conditions.

SCHÖN. **Peronospora auf jungen Hopfenpflanzen.** [*Peronospora* on young Hop plants.]—*Wiener Landw. Zeit.*, lxxviii, 20, p. 179, 1928.

Attention is drawn to the likelihood of an epidemic of *Peronospora* [*Pseudoperonospora humuli*] on young hops in Austria as a consequence of the mild winter of 1927–8, and full directions are given for the control of the disease by spraying with 0·75 per cent. Bordeaux mixture.

LANG (W.) & ARKER (H.). **Der falsche Mehltau des Hopfens. Erfahrungen im Jahre 1927.** [Downy mildew of Hops. Experiences of the year 1927.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, viii, 4, pp. 29–31, 1928.

An account is given of the authors' observations on downy mildew of hops (*Peronospora*) [*Pseudoperonospora humuli*] in Germany during 1927. At the beginning of August the stand looked very promising, but the protracted rainy period following this date resulted in heavy damage even to the relatively resistant Saazer, Schwetzinger, Alttettnanger Früh, and Striesslspalt varieties. The outcome of experiments in the control of the disease shows that Bordeaux mixture is the most effective and economical of all the preparations tested. It should be applied at a strength of 1 per cent. for the early and final applications, and at 1·5 per cent. during June and July. For the treatment of 1,000 stocks 30 to 40 kg. each of copper sulphate and lime will suffice for the entire growing period.

BLATTNÝ (C.) & DUCHON (F.). **Beitrag zur Frage der Düngung des Hopfens als Mittel gegen die Hopfenperonospora (Pseudoperonospora humuli).** [Contribution to the question of the fertilizing of Hops as a means for the control of the Hop *Peronospora* (*Pseudoperonospora humuli*).]—*Ernähr. der Pflanze*, xxiv, 9, pp. 140–142, 2 diags., 1928.

During the last few years the writers have made observations in Prague on the susceptibility to *Pseudoperonospora humuli* of the Böhmischer Roudnitzer früher Edelhopfen hop variety grown under different conditions.

In an experimental plot receiving varying combinations of fertilizers, the severely infected plants contained 35 per cent. more nitrogen and 45 per cent. more phosphoric acid than the slightly diseased individuals, while the potash and lime content of the former was 40 and 35 per cent., respectively, less than that of the latter. Thus it would seem that the application of potash and lime tends to decrease the susceptibility of hops to downy mildew, while the reverse is the case with phosphoric acid and nitrogen. The favourable effect of lime has also been observed in Jugo-Slavia, where the highly susceptible Württemberg variety remained completely immune from infection during two years' cultivation along the edge of some lime pits. The fact that the disease has not

gained a stronger foothold in Czecho-Slovakia is ascribed by the writers to the practice of liberal fertilizing with potash and lime.

Sugar Cane specialists will explore New Guinea for disease-resistant varieties.—*Planter and Sugar Manufacturer*, lxxx, 15, p. 299, 1928.

An expedition starting in April, 1928, under the leadership of Dr. E. W. Brandes, has been organized by the United States Department of Agriculture to search for disease-resistant varieties of sugar-cane in New Guinea, where this plant is believed to be indigenous. An aeroplane will be used and the varieties obtained will be propagated at a garden to be established at Port Moresby, on the south-east coast of the island.

Shirai (M.) & Hara (K.). **A list of Japanese fungi hitherto known.**—Third, revised and enlarged ed., vi + 504 pp., Shizuoka, Japan, 1927.

The first edition of this book was written in 1905 by M. Shirai, honorary professor of the Tokyo Imperial University. In 1917 it was revised and enlarged by Professor I. Miyake of the Tokyo Agricultural College. The present publication is the third edition, revised and enlarged by K. Hara, Expert of the Prefectural Agricultural Society of Shizuoka. It is a very laborious compilation containing about 4,500 species of fungi hitherto recorded in Japan.

In addition, a list of the bacterial pathogens of plants known in Japan is given by K. Nakata, Professor of Plant Pathology of the Kyûsyû Imperial University.

The list is arranged in alphabetical order of the Latin names of the fungi, and some important references in European languages are given, although the host names are only in Japanese. Nevertheless it should be very useful to European and American mycologists as well as plant pathologists. It may be obtained from the reviser, Mr. K. Hara, c/o The Agricultural Society of Shizuoka Prefecture, Shizuoka, Japan, the price being $3 including postage.

Güssow (H. T.) & Odell (W. S.). **Mushrooms and toadstools.**—274 pp., 128 pl. (1 col.), Ottawa, Canadian Ministry of Agriculture, 1927.

This is an account of the common edible and poisonous fungi of Canada. Upwards of 180 species are briefly described, and the descriptions are amply illustrated with fine photographic plates. Notes are given on such general matters as the use of fungi as food, mushroom culture, and poisoning by fungi. The book aims at being of use alike to the student and nature lover, and its highly educative nature can alone account for its extremely low cost ($ 1).

Sydow (H.). **Novae fungorum species. XIX.** [New species of fungi. XIX.]—*Ann. Mycol.*, xxvi, 1–2, pp. 132–139, 1928.

Detailed descriptions are given of a few new species of fungi. *Physoderma fabae* is described on leaves and petioles of the broad bean (*Vicia faba*) from Japan.

CIFERRI (R.) & GONZÁLEZ FRAGOSO (R.). **Hongos parásitos y saprofitos de la República Dominicana. (15ª serie).** [Parasitic and saprophytic fungi of the Dominican Republic. (15th series).]—*Bol. R. Soc. Española Hist. Nat.*, xxviii, 4, pp. 221–228, 1 fig., 1928.

In this, the fifteenth series of the authors' descriptions of Dominican fungi [*R.A.M.*, vii, p. 538], the following species are of phytopathological interest. *Systromma cinnamomei* n. sp. ad int. forms on living leaves of *Cinnamomum camphora* scattered, dark brown to black, rounded, hypophyllous, Dothidaceous stromata up to 3 mm. in diameter, containing immersed, globose, ostiolate loculi, with cylindrical-claviform asci which are 45 to 65 by 12 to 16 μ in diameter, and without paraphyses; the ascospores are cylindrical-ellipsoidal, 12 to 15 by 3·5 to 4·5 μ, at first hyaline and continuous, later fuscous and two-celled. This fungus was found in association with various other species, including *Cladosporium scopiforme. Apiosporopsis saccardina* was found causing reddish spots on living loquat leaves (*Eriobotrya japonica*), in association with several other fungi, including *Septoria eriobotryae. S. penniseti* n. sp. ad int. was found on dry leaves of *Pennisetum purpureum* forming numerous scattered, amphigenous, black, globose, ostiolate pycnidia from 60 to 95 μ in diameter, at first immersed and then erumpent; the spores are very numerous, hyaline, fusoid and falcate, continuous, and 12 by 2 μ in diameter; no sporophores were observed.

SYDOW (H.). **Fungi borneenses.** [Fungi from Borneo.]—*Ann. Mycol.*, xxvi, 1–2, pp. 85–99, 1928.

The paper records 22 species of small leaf fungi collected in British North Borneo; of these 9 are species of *Meliola*. The new species are described at length and Latin diagnoses are given.

SYDOW (H.). **Fungi chilenses a cl. E. Werdermann lecti. Pars prima.** [Chilean fungi collected by E. Werdermann. Part one.]—*Ann. Mycol.*, xxvi, 1–2, pp. 99–126, 1928.

This paper records some 50 species of fungi, including many parasites, collected on woody and herbaceous hosts in Chile. A number of new species and some new genera are described.

SYDOW (H.). **Fungi in itinere costaricensi collecti. Additamentum.** [Fungi collected on a journey in Costa Rica. Addition.]—*Ann. Mycol.*, xxvi, 1–2, pp. 127–131, 1928.

This is a short addition to the author's account of the fungi he collected in Costa Rica in 1924–5 [*R.A.M.*, vi, p. 322]. Several further records are given, and a number of host plants of fungi described in the earlier parts are now named.

CARNE (W. M.). **Additions to the plant diseases of south-western Australia.**—*Journ. Roy. Soc. Western Australia*, xiv, 3, pp. 23–28, 1927. [Received August, 1928.]

This list of plant diseases is on similar lines to that previously published [*R.A.M.*, v, p. 118] and includes, among others, the following new records for the area concerned: *Sclerotinia sclerotiorum* on young apricot fruit; *Macrophomina phaseoli* on French beans

[*Phaseolus vulgaris*] causing foot rot, and in the *Rhizoctonia bataticola* stage on Cape gooseberry [*Physalis peruviana*] and lucerne; *Sclerotium rolfsii* on French beans; *Pleosphaeria semeniperda* causing seedling blight of wheat; brown spot of wheat caused by *Penicillium* sp., *Macrosporium* sp., and *Cladosporium* sp.; and *Fusarium oxysporum* var. *gladioli* on gladiolus corms.

CIFERRI (R.). **Quarta contribuzione allo studio degli Ustilaginales (no. 55–126).** [Fourth contribution to the study of the Ustilaginaceae (nos. 55–126).]—*Ann. Mycol.*, xxvi, 1–2, pp. 1–68, 1 pl., 1928.

This continues the series previously noticed [*R.A.M.*, iv, p. 69; v, p. 251]. The author decides that the genus *Endothlaspis* Sorokin is not distinct from *Sphacelotheca*, and renames *E. sorghi* on *Sorghum cernuum* [*Andropogon sorghum*] *Sphacelotheca sorokiniana* Cif. He is not able to decide whether it is, or is not, identical with any *Sphacelotheca* on sorghum already known. Six new smuts are recorded for the Dominican Republic; among these are *Doassansia eichhorniae* on the water-hyacinth, *Eichhornia crassipes*. He emends the genus *Entylomella* [*R.A.M.*, iii, p. 687], and suggests for its neo-type species, *E. sidae-rhombifoliae* Cif., n. sp., the conidial stage of the *Entyloma* of that name described by the author in his paper on *Sida rhombifolia* in the Dominican Republic. He proposes to restrict the genus *Cintractia* Cornu to species occurring on Cyperaceae and Juncaceae. He has revised the North American species of *Entyloma*, mostly on material received from Prof. Davis of Wisconsin, and proposes nine new species. He also gives a key to all the known species of *Entyloma*.

SCHWEIZER (J.). **Over Erysiphaceen (meeldauwschimmels) van Java.** [On the Erysiphaceae (mildew fungi) of Java].—*Arch. voor Rubbercult. Nederl.-Indië*, xii, 5, pp. 323–342, 2 figs., 1928. [English summary.]

In addition to the six hosts of Erysiphaceae in Java originally described by Raciborski in 1900 (including tobacco and *Cucurbita* sp.), 35 are enumerated in the present paper, of which the following are of special interest.

Tomato mildew (*Oidium* sp.) was first observed in June, 1923. The fungus covers both leaf surfaces with a thick, white coating; the affected foliage turns yellow and dies prematurely. The average dimensions of the conidia are 30·9 by 16·2 μ.

Ceara rubber (*Manihot glaziovii*) leaves showing white patches of an *Oidium*, chiefly on the upper surface, were received from the Malang Experiment Station in August, 1927. The conidia of this species measure 31·3 by 17·8 μ.

In June, 1927, the upper leaf surfaces of *Indigofera sumatrana* at the Besoeki Experiment Station showed delicate, grey, cobweb-like patches. Seedlings were much more severely affected than fully grown plants, but no appreciable damage was caused. *I. arrecta* and *I. endecaphylla* in close proximity to the affected plants remained immune. The conidial dimensions of this *Oidium* average 33·7 by 15 μ.

In August, 1927, dense, white, powdery patches of *Oidium*

[? *tingitaninum*: *R.A.M.*, iv, p. 733] were observed on both surfaces (especially the upper) of orange leaves, and in September very heavily infected material was also received from Malang. The conidia measured 36·1 by 14 μ.

The widely distributed mildew of *Capsicum annuum* was first observed in Java in June, 1924. It is caused by *Leveillula* [*Oidiopsis*] *taurica* and may be recognized by the unusually large, cylindrical conidia measuring 65·6 by 19·2 μ. This is stated to be the only mildew determinable without the perithecial stage. In contradiction to Salmon's statement as to the xerophytic nature of the organism, the author observed its occurrence in the middle of the rainy season. *O. taurica* also caused heavy damage to mulberries (*Morus alba*) in 1921, attacking the lower leaf surface and causing a yellow discoloration and desiccation: the yield of fruit was reduced to a minimum. The same fungus was found in September, 1927, on *Euphorbia pulcherrima* and in January, 1928, on *Tropaeolum majus*. Attention is drawn to the occasional occurrence in this species of conidiophores bearing two conidia.

Discussing the relation between environmental conditions and the occurrence of mildews, the author points out that the majority of the Javanese hosts are most virulently attacked during the dry season. The combinations of factors causing infection and determining its progress are extremely variable, and also lead to differences in the development of the disease.

Miss Bouwens's opinion that the conidial dimensions of the Erysiphaceae are sufficient to differentiate the species [ibid., vi, p. 511] is not accepted, the writer agreeing with Blumer [ibid., vi, p. 124] that this criterion should serve only as a distinguishing character for subspecies within the collective species.

STEINMANN (A.). **Over de spinnewebschimmels van Java (in het bijzonder op Piper nigrum en Myristica fragrans).** [On the cobweb fungi of Java (especially on *Piper nigrum* and *Myristica fragrans*).]—*Arch. voor Cacao Nederl.-Indië*, Deel 2, pp. 44–47, 6 pl., 1928. [English summary on pp. 58–59.]

After a brief explanation of Petch's classification of the thread blights into the *Corticium* and Marasmioid groups [*R.A.M.*, iv, p. 66], the author describes the occurrence of organisms of the second group on a number of hosts in Java.

During the past year species of the Marasmioid group with anchor cells have been found on tea, *Hevea* rubber [ibid., vi, p. 116], nutmeg (*Myristica fragrans*), pepper (*Piper nigrum*), *Desmodium heterocarpum*, *Nephrolepis hirsutula*, and *Imperata arundinacea*. Miss Schwarz further records the occurrence in Java of thread blight fungi with anchor cells on orchids (*Pomatocalpa*) from Singapore (*Ind. Cult.*, [xii], 1, p. 14, 1927), mahogany (*Swietenia mahagoni*), teak (*Tectona grandis*) [ibid., vi, p. 383], and *Gardenia*.

The anchor cells of the tea thread blight average 8 to 16 μ in diameter; they are mostly spherical, with few protuberances. On *N. hirsutula* they are globular and seldom show protuberances, while on *D. heterocarpum* these are conspicuous. The average dimensions of the anchor cells (without protuberances) were found

to be as follows: on *I. arundinacea* 14 to 18 μ, on *N. hirsutula* 9 to 16 μ, on *D. heterocarpum* 12 to 20 μ, on nutmeg 14 to 16 μ, and on pepper 10 to 20 (generally 10 to 15 μ). These differences, however, are not sufficiently constant to serve as specific characters. The function of the anchor cells remains obscure: they bear a certain resemblance to the chlamydospores of other fungi, but all attempts to induce germination have hitherto failed.

Serious damage is caused by the thread blight occurring on *P. nigrum*. The white strands pass from the branches along the petiole to the leaf, and sometimes reach the fruit, causing discoloration and shrivelling. The leaves are united in bundles by the strands. The disease is most severe in deeply shaded areas, but it may also occur on plants exposed to full sunlight, showing that the causal organism can resist desiccation. Control should be based on the removal of superfluous shade, the excision and burning of infected material, and the application to the thicker branches of a 20 per cent. solution of carbolineum. Similar measures are indicated in the case of nutmeg.

In a postscript the writer adds that Robusta coffee leaves attacked by the Marasmioid cobweb fungus with anchor cells [ibid., iv, p. 67] were submitted for his inspection in November, 1927. The affected trees were growing in an estate situated about 3 km. from the sea at an altitude of some 300 ft. above sea-level. This plantation is reported to receive ample sunlight, in contrast to others at higher altitudes and further from the sea, where the coffee, though heavily shaded by *Artocarpus* and *Durio zibethinus* trees, has remained healthy.

RICHTER (H.). **Die wichtigsten holzbewohnenden Nectrien aus der Gruppe der Krebserreger.** [The most important wood-inhabiting Nectriae of the group of organisms causing canker.] —*Zeitschr. für Parasitenkunde*, i, 1, pp. 24–75, 10 figs., 2 graphs, 1928.

In this comprehensive memoir the author surveys the literature, geographical distribution, and taxonomy of the principal Nectriae causing canker of fruit and other trees, and gives full particulars of his cultural and inoculation experiments with various members of the group.

The species of *Nectria* comprised in these studies are divided into two groups, one containing *N. galligena* and *N. ditissima* and the other *N. coccinea* and *N. punicea* with their varieties [*R.A.M.*, iii, p. 429]. The conidial dimensions are of great importance in the differentiation of the species, and may, in fact, be taken as criteria for this purpose. The straight, very slender conidia of *Cylindrocarpon willkommii* (the imperfect stage of *N. ditissima*) are readily distinguishable from the curved, thick ones of *C. album* var. *majus* (*N. punicea*). The average length of the ascospores of *N. punicea* corresponds with those of *N. ditissima*, but the two species differ in shape, the ratio of length to breadth averaging 2·30 in the latter and 2·95 in the former species. The cultural characters of the two species are also distinct, the colonies of *N. ditissima* being pale, while dark brown plectenchymatous layers often cover the medium in cultures of *N. punicea*. The last-named species is placed in the

same group as *N. coccinea* (the conidial stage of which is *C. candidum*) on account of its conidial shape and general cultural behaviour. *N. ditissima* and *N. galligena* may also be differentiated by their conidia, those of the former being longer and more slender than those of the latter (*C. mali*).

The species studied in these investigations were found to fall into several distinct varieties. Thus, a form of *N. galligena* causing canker of ash (*Fraxinus excelsior*) trees has been designated var. *major* by Wollenweber [see next abstract] on account of its exceptionally large ascospores (20 by 6·7 μ compared with 15·9 by 6·7 for the normal average dimensions of the species). This variety (the conidial stage of which is known as *C. mali* var. *flavum*), is characterized by its vivid orange to reddish coloration in culture. It is not capable of infecting apple, beech, poplar (*Populus nigra*), maple (*Acer*), or conifers, and inoculation experiments gave positive results only on pear and red currant (*Ribes sanguineum*) in isolated cases. On the other hand, the typical form of *N. galligena*, which was isolated from various hosts and found to retain its virulence for two to three years in culture, produced true canker of apple trees in every test. The results with pear trees were less definite, and beeches scarcely reacted to inoculation, except in the case of a strain isolated from *Sorbus* [*Pyrus*] *aucuparia*. Poplars were only infected by a strain from the same host. Red currants inoculated with *N. galligena* developed a rot of the cortex but no typical cankers.

N. ditissima, isolated from beech, produced typical cankers on apple, pear, beech, and *P. aucuparia*. *N. d.* var. *arctica* (*C. w.* var. *minus*), isolated from a birch canker, was transmitted to pear. *N. d.* var. *major* (*C. w.* var. *pluriseptatum*), isolated from *Alnus*, gave positive results on pear, alder, apple, and beech.

N. coccinea var. *sanguinella* (*C. candidum* var. *medium*), isolated from poplar, caused slight infection of the cortex of the same host but was unable to produce true canker. In no case did *N. coccinea*, *N. coccinea* var. *longiconia* (*C. candidum* var. *majus*), *N. coccinea* var. *minor* (*C. candidum* var. *minus*), or *N. punicea* prove pathogenic on the wood of the hosts used in these experiments.

No difference in the reaction to inoculation with *N. galligena* could be detected in a number of well-known apple varieties, including Golden Pearmain and three types of Reinette. Apple fruits were most severely attacked by *N. galligena* from apple and *P. aucuparia*, *N. ditissima* from beech, and *N. coccinea* var. *longiconia* from maple. The growth in apples of *N. ditissima* var. *major* from alder and of *N. coccinea* from beech was much slower, and *N. galligena* var. *major* from ash caused very slight infection. Inoculations with *N. punicea* gave negative results in every case.

WOLLENWEBER (H. W.) **Ueber Fruchtformen der krebserregenden Nectriaceen.** [On the fruit forms of the Nectriaceae causing cankers.]—*Zeitschr. für Parasitenkunde*, i, 1, pp. 138–173, 20 figs., 1928.

The characters of the form genus *Cylindrocarpon* and of the species of *Nectria* forming its perfect stage are given and the pathogenic species described [see preceding abstract]. *C. decumbens*

n. sp., found on the decaying wood of a wild *Pyrus* at Carlshafen [Hesse-Nassau], is characterized by a white (later pale yellow-ochre), caespitose mycelium; cylindrical, straight, or slightly curved conidia, generally 3- to 5-septate and measuring 46 by 5 or 70 by 5·5 μ; and terminal, continuous or bicellular, globose, smooth or rugose chlamydospores, 7 μ in diameter. A number of new combinations and varieties and some revised diagnoses are also given.

SUNDARARAMAN (S.). **Some Vermicularias of economic importance in South India.**—*Madras Agric. Dept. Year Book 1926*, pp. 10–12, 1927. [Received 1928.].

English diagnoses are given of the following species of *Vermicularia* attacking crops of economic importance in the Madras Presidency: *Vermicularia capsici* [*R.A.M.*, vii, p. 73]; *V. curcumae* [ibid., vi, p. 142], with which the species on cabbage and knolkohl [*Brassica oleracea* var. *caulo-rapa*] is believed to be identical; *V. zingiberae* n. sp. on leaves, petioles, and rhizome scales of ginger; and *V.* sp. on gram (*Cicer arietinum*). *V. zingiberae* is characterized by dense clusters of black, circular to oval pycnidia, 50 to 140 μ in diameter, numerous erect, dark brown, septate setae measuring 85 to 168 μ, and hyaline, subfusoid, curved, minutely guttulate spores, 17·5 to 24 by 3·15 to 4·2 μ. *V.* sp. on *C. arietinum* possesses concentric, subdivided, superficial pycnidia, 50 to 80 by 6 to 9 μ, and unicellular, hyaline spores measuring 21 to 34 by 3 to 6 μ.

SMALL (W.). **Further notes on Rhizoctonia bataticola.**—*Trop. Agriculturist*, lxx, 4, pp. 227–231, 1928.

Since the publication of the last list of hosts of *Rhizoctonia bataticola* (*Macrophomina phaseoli*) [*R.A.M.*, vii, p. 407] the following are some of the new records that have been made in Ceylon. The fungus was found attacking a grafted *Hevea* stock, and also seedlings of jak [*Artocarpus integrifolia*]. At Heneratgoda *R. bataticola* was isolated alone from the smaller diseased roots of old *Hevea* trees, while on the larger roots of these trees it was associated with *Fomes lamaoensis*; the condition of the latter roots indicated, in the author's opinion, that *F. lamaoensis* would have had full opportunity of attacking adjacent healthy roots which were in close contact with the diseased ones, if it had been capable of doing so. With reference to the case recorded in Ceylon, in which the sudden death of a *Hevea* tree with the majority of its smaller roots attacked by *R. bataticola*, while the larger roots were entirely healthy, was tentatively ascribed to lightning injury, the author recounts his experience in Uganda of a similar sudden death of adult coffee trees (*Coffea robusta*) on two occasions. An examination of the roots of these trees showed that *R. bataticola* (the only organism isolated from them) had penetrated and permeated the root systems so thoroughly and regularly as to suggest that on reaching a certain point it had caused a sudden and complete stoppage of water supply from the roots, thus leading to a rapid wilting and death of the trees.

In a case of a root disease of young tobacco seedlings, all the

affected plants showed the presence on their roots of *R. bataticola* and eelworms (*Heterodera radicicola*) either singly or in association. The plants, however, did not exhibit any outward sign of weakness of root and stem development. At the Experiment Station, Peradeniya, some well-grown avocado pear trees were found to suffer from a root disease with which *R. bataticola* was associated. At the same station the roots of a young sandalwood (*Santalum album*) tree were found to be attacked by *R. bataticola*, hyphae of which occurred in abundance in the inner cortical tissues. Investigation of a recent case of death of cardamoms (*Elettaria cardamomum*) in patches showed that their roots contained thin black lines, from which *R. bataticola* was grown in culture: the root disease was followed by a rot of the rhizomes of the affected plants. Finally, the author refers to a recent discovery of *R. bataticola* on tea, both seedlings and older plants, in Java.

Boedijn (K. B.). **Das Myzel von Parodiella spegazzinii Theiszen et Sydow.** [The mycelium of *Parodiella spegazzinii* Theissen et Sydow.]—*Zeitschr. für Pflanzenkrankh. und Pflanzenschutz*, xxxviii, 5–6, pp. 129–132, 4 figs., 1928.

A detailed examination of *Parodiella spegazzinii*, the cause of severe damage to *Crotalaria usaramoensis* in Sumatra [*R.A.M.*, v, p. 254], showed that the perithecia measure 120 to 400 μ, with an ostiole averaging about 25 μ. The asci are cylindrical, 120 to 160 by 18 to 22 μ, and contain eight hyaline, later light brown, irregularly biseriate, bicellular ascospores measuring 28 to 36 by 8·5 to 12 μ. The long, filamentous, hyaline paraphyses are 1·5 to 2 μ in width. The fairly abundant mycelium is formed chiefly between the epidermis and cuticle, and in close proximity to the perithecia it may readily be taken for a greatly reduced basal stroma. From this stroma-like tissue, very pale brownish hyphae penetrate the epidermal cells, sometimes in pairs or several at a time, and send out very slender branches which force their way between the palisade cells and ultimately reach the spongy parenchyma or even the epidermis of the under side of the leaf. This explains the serious nature of the injury caused by the fungus.

The presence of the ostiole excludes *P. spegazzinii* from the Perisporiales, and for the present the author considers that this species should be placed, together with *P. perisporioides* and *P. caespitosa* (shown by von Höhnel in 1918 to possess ostioles) close to *Otthia* and *Gibbera* in the Cucurbitariae.

Kuyper (J.). **Verslag van het Deli Proefstation over het jaar 1927.** [Report of the Deli Experiment Station for the year 1927.]—*Meded. Deli Proefstat. te Medan-Sumatra*, Ser. II, liii, 59 pp., 1928.

This report contains the following references of phytopathological interest other than those already noticed from different sources. At the instigation of the Planters' Committee, a questionnaire has been prepared with a view to obtaining exact data concerning the distribution of slime disease of tobacco [*Bacterium solanacearum*: *R.A.M.*, vi, p. 759] in the estates under the supervision of the Deli Experiment Station. Attempts to control

this disease by steam sterilization of the soil gave promising, though not altogether conclusive, results on a small scale, but it is doubtful whether a wider application of this method would be economically feasible [ibid., vi, pp. 131, 444]. Selections from the progeny of the slime-resistant strain R. 12 [loc. cit.] maintained their superiority in a further test at Two Rivers, but in another locality little difference was observed between the behaviour of the selected strains and that of the general run of plants.

A severe epidemic of *Phytophthora* [*nicotianae*: ibid., vi, p. 442] occurred on the Bekioen estate as a result of flooding, and thousands of leaves were lost. The systematic removal of all infected material rapidly checked the spread of the disease. The stems of the plants were not attacked and altogether the symptoms caused by *P. nicotianae* in Deli are different from those occurring in the Vorstenland [ibid., iii, p. 434 *et passim*]. The valuable preventive effects of spraying with Bordeaux mixture do not yet appear to be fully realized by the planters in general.

Red rust [ibid., vi, pp. 131, 445] was particularly severe on the 180 Deli Mij. strain. Recent laboratory investigations failed to reveal any trace of a parasite in connexion with the disease.

A disease of *Albizzia* trees was associated with infection by *Pythium* and eelworms.

HOPKINS (J. C. F.). **Frenching of Tobacco.**—*Rhodesia Agric. Journ.*, xxv, 5, pp. 588–590, 4 figs., 1928.

With reference to his previous report [*R.A.M.*, vii, p. 476] the author now states that true frenching of tobacco does occur occasionally in Rhodesia. Crinkled plants [loc. cit.] which often had a mop-like growth of fibrous roots instead of a tap root, were most frequently observed on ant heaps, a fact which indicates that excess of nitrogen may contribute to this condition; the disease is not infectious, and is caused by some interference with the nutrition of the plant. A similar condition is caused by a deficiency of soil potash.

BRYAN (MARY K.). **Bacterial canker of Tomatoes.**—*U.S. Dept. of Agric. Circ.* 29, 8 pp., 6 figs., 1 map., 1928.

In 1927, the Grand Rapids disease [*Aplanobacter michiganense*: *R.A.M.*, vii, p. 362] of tomatoes, previously regarded as confined, in the United States, to the north-eastern region, though also reported from British Columbia [ibid., vi, p. 272] appeared in a virulent form in some of the southern and western States. As the symptoms of this disease [which are described in popular terms] may be confused with those of other wilts of the same crop, it is thought probable that it is also present in areas from which it has not yet been reported.

The disease, which attacks both field and hothouse plants, was recorded in Illinois in 1925, on plants from Georgia; in 1927, it was severe both in the latter state and in Utah, and was also reported in Montana on plants from Utah. In Georgia, the losses ranged from 10 to 70 per cent., in Utah from 2 to 60 per cent., while large commercial plantings in Michigan also suffered severely.

It is considered to be certain that infection may be carried by

young and apparently healthy plants; circumstantial evidence points to the seed as the source of infection, and sterilization with mercuric chloride is accordingly advised.

MILBRATH (D. G.). **Late blight of Tomato.**—*Monthly Bull. Dept. of Agric. California*, xvii, 4, pp. 271–274, 1928.

In 1926, late blight (*Phytophthora infestans*) caused heavy losses in the late tomato crop in a few scattered areas in southern California, and in 1927 the disease reached epidemic proportions, reducing the yield to approximately 105 boxes per acre as compared with 318 in the former year. In both years the heaviest damage was sustained after rain.

For control purposes, five to seven applications of Bordeaux mixture (5–5–50) are recommended; under local conditions the cost of the ingredients for five applications, each at the rate of 150 galls., is estimated at \$6·37 per acre.

MÜLLERS (L.). **Solbar zur Bekämpfung der Tomatenkrankheiten.** [Solbar for the control of Tomato diseases.]—*Nachricht. über Schädlingsbekämpf.*, iii, 1, pp. 28–29, 1928.

The writer has obtained good control of late blight, leaf spot, and leaf mould of tomatoes (*Phytophthora infestans*, *Septoria lycopersici*, and *Cladosporium fulvum*) by thorough disinfection of the soil and greenhouses with uspulun, dusting the seed with tillantin R, and spraying the plants with 1 per cent. solbar at intervals of 3 to 4 weeks from the inception of flower-bud formation to the ripening of the fruit.

STAPP (C.). **Ueber die Ursache des Ulmensterbens.** [On the cause of the die-back of Elms.]—*Mitt. Deutsch. Dendrol. Gesellsch.*, xl (1928), pp. 139–146, 1 fig., 1928.

The author has investigated Brussoff's claim that *Micrococcus ulmi* is the causal organism of the die-back of elms and other trees [*R.A.M.*, vii, p. 353].

Attempts to isolate bacteria from infected material of elm (*Ulmus montana*), beech, and *Crataegus oxyacantha* received from Brussoff gave entirely negative results. Brussoff's consistent isolation of bacteria from diseased material is attributed to defective technique, especially in the use of a liquid medium (elm wood decoction) instead of a solid one. On the other hand, *Graphium ulmi* [ibid., vii, p. 286 and next abstract) was isolated from all the specimens showing the characteristic symptoms of die-back.

The examination of two cultures received from Brussoff as *M. ulmi* showed that these contained two and three different bacteria, respectively, none of which was a coccus. A culture obtained from the Kral Culture Collection in Vienna of the strain which Brussoff had originally sent there contained a coccus. Inoculation experiments with three of the six distinct strains of bacteria described by Brussoff at various times as *M. ulmi* gave negative results on elm (*U. montana*), lime (*Tilia cordata*), and sycamore (*Acer pseudoplatanus*) as regards die-back, but one of the elm seedlings inoculated with the Kral strain showed later leaf roll, desiccation, and a dark grey discoloration of the interior of the wood. From this

seedling *Verticillium albo-atrum* was isolated and the author considers that this fungus may be responsible for a wilt disease characterized by symptoms similar to those of die-back. The same fungus is also known to cause a wilt of sycamore [cf. ibid., vii, p. 286] and it is thought probable that the symptoms ascribed by Brussoff to *M. ulmi* were really due to this organism. *G. ulmi* was isolated by Miss Spierenburg from a sample of elm inoculated by Brussoff with his 'Königsberg' strain, while *Phoma hapalocystis* developed in some 80 per cent. of the writer's cultures from similar material on beerwort agar.

The completely negative outcome of these isolation and inoculation experiments is considered to show that neither *M. ulmi* nor any other bacterium is involved in the etiology of the die-back of elms, which Wollenweber [loc. cit.] has conclusively shown to be caused by *G. ulmi.* It is of the utmost importance to ascertain whether any degree of varietal resistance to this organism exists among the cultivated varieties of elms, since the selection of immune or resistant varieties is more likely to prove successful in the control of die-back than Ilisch's immunization method [*R.A.M.*, vii, p. 426] or similar processes of internal therapy.

It cannot yet be determined how far bacteria are implicated in the diseased condition of beeches, poplars, limes, &c., under Brussoff's observation, but there need be no fear of the 'transmission' of *M. ulmi* from elms to other trees, since no pathogenic strain of this organism exists.

Wollenweber (H. W.) & Stapp (C.). **Untersuchungen über die als Ulmensterben bekannte Baumkrankheit**. [Investigations on the tree disease known as die-back of Elms.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xvi, 1, pp. 283–324, 3 pl., 8 figs., 1928.

The external and internal symptoms of die-back of elms (the so-called 'Dutch elm disease') are fully described, the various theories concerning its etiology are discussed, and notes are given on its distribution in Germany and elsewhere. The authors draw attention to the characteristic hooked shape of the young branches attacked in the preceding year. A full account, supplemented by tables, is also given of the negative results of the bacteriological investigations on the strains of *Micrococcus ulmi* supplied by Brussoff [see preceding abstract].

Graphium ulmi, on the other hand, was isolated with extreme regularity from all the elm samples (twigs, trunk, and roots) examined. The fungus was cultured in potato juice agar (P_H 4·8) with the addition of 1 per cent. dextrose. The mycelium is composed of septate hyphae ranging from 0·5 to 6 μ in thickness. The aerial mycelium fruits rapidly, and on some substrata so profusely that it is soon completely covered by a whitish layer of spore-bearing mucilage. The conidia, which in the mass are at first white, then brownish- or yellowish-white, and golden-yellow when dry, are either abstricted at the apex of the irregularly branched or sometimes whorled conidiophore in false heads (so-called *Cephalosporium* stage), or extend in a mucilaginous layer over the prostrate mycelium (pionnotes stage). The pionnotes are formed both by the

profuse production of conidia from the mycelium and by yeast-like budding of young conidia direct from the mother conidium. Sometimes matted bundles of hyphae are formed in the aerial mycelium the golden-yellow heads spreading out like the twigs of a broom while the stalk (which may turn black) is composed of solid rod-like hyphae. These bodies may be distinguished from the true coremia, which they resemble except in their considerably larger dimensions (up to several centimetres in length), by their regular fructification, more sharply defined outlines, and darker coloration. According to the nature of the medium they vary greatly in size, exhibiting both dwarf and elongated forms. The coremia reach their greatest length when grown on woody branches, and remain comparatively small on the stems of herbaceous plants and on cornmeal agar. They arise from a stroma of black or slightly tinted hyphae and consist of a stalk and small head. The stalk is filamentous, columnar or clavate, of varying diameter, and black with a paler upper portion. At the apex it branches out on every side into bundles of verticillate, branched conidiophores on which the conidia are deposited in the form of a golden-yellow crust. The average dimensions of the coremial conidia are 3·7 by 1·7 μ (the greatest number falling in the classes 3·4 to 3·8 by 1·5 to 1·7 μ, but some are up to 11 by 3 μ), and those of the yeast form 5·7 by 2·6 μ (the greatest number in the classes 5·8 to 6·2 μ by 2·7 to 3 μ but occasionally up to 12 by 4·5 μ). The conidia are pyriform, straight, occasionally slightly curved, sometimes long-ellipsoid, and almost invariably unicellular until germination, when they often become bicellular. The dark brown, spherical sclerotia, which also arise in the stromata, measure 40 to 60 μ; they possess a coarsely granular, plectenchymatous structure. Chlamydospores have hitherto not been observed. These characters agree fairly closely with those given by Miss Schwarz for *G. ulmi* [*R.A.M.*, ii, p. 93], except in the absence of chlamydospores and the presence of sclerotia. *G. ulmi* differs in the size and shape of its conidia from various other species of *Graphium* [which are tabulated], and in several other particulars from *Sporocybe corticalis* and *G.* (*Hantzschia*) *phycomyces*.

In a brief discussion on the possible perfect stage of *G. ulmi*, the first-named author mentions the isolation, from decayed fir wood, of a species of *Ceratostomella*, the conidial stage of which resembled *Graphium* in pure culture except that no coremia were formed. This species is stated to differ from *C. pini* [ibid., vii, p. 211] and the other species of *Ceratostomella* described by Münch (*Naturw. Zeitsch. für Land- und Forstw.*, [v, p. 531], 1907). The conidia are ellipsoid, cylindrical, or comma-shaped, measuring 5·3 to 5·5 by 1·1 to 1·7 μ, and the perithecia, the base of which is surrounded by hyphae radiating in all directions, measure 1·4 by 0·2 mm. Possibly this may be the perfect stage of *G. ulmi*, but the fungus is by no means dependent on the development of this stage for its hibernation which is fully provided for by the sclerotia and perhaps by chlamydospores.

In addition to the successful results of inoculation with *G. ulmi* already reported [ibid., vii, p. 286], a further experiment was made at the end of September, 1927. In February, 1928, most of

the 18 seedlings of *Ulmus montana* inoculated in the late autumn showed the typical internal discoloration associated with die-back, but up to the end of June no outward symptoms of the disease were apparent. The slow course of the autumn inoculations is in marked contrast to the rapidity of the summer series, in which the disease developed within six weeks [loc. cit.]. On the other hand, two out of three 20- to 25-year-old elms (*U. montana*) inoculated through bore holes in the stem some feet above ground level in September showed the typical internal symptoms of die-back in February, while defoliation had begun in the branches below the seat of inoculation by the middle of June, and by the end of the month, some of the upper branches began to die back. The strains of *G. ulmi* used for these inoculations (and reisolated from the diseased individuals) were obtained from Duisburg and Nürnberg, respectively.

Among the species and varieties of elm which have been found susceptible to die-back may be mentioned *U. montana*, *U. campestris*, and *U. americana* with their varieties [which are enumerated]. In this connexion the possibilities of developing a form combining resistance to die-back with other desirable qualities are briefly discussed. It is, however, also pointed out that extensive investigations along these lines have yet to be made.

The assumption that *G. ulmi* is conveyed by insects is supported by the discovery, in June, 1928, of luxuriantly fructifying mycelium of the fungus in the pupae and galleries of the bark beetle *Scolytus scolytus* in the bark of diseased and dead trees.

The disease has now been found to be widely distributed in Germany, from the Dutch frontier to Berlin, Hamburg, Breslau, Nürnberg, Dresden, and Durlach (Baden). It has also been found in specimens sent from Vienna.

KÖCK (G.). **Ueber das Ulmensterben und die Bekämpfung von Baumkrankheiten durch Baumimpfungen.** [On the die-back of Elms and the control of tree diseases by tree injections.]—*Gartenzeit. Österr. Gartenbaugesellsch. Wien, 1928,* 7, pp. 107–108, 1928.

In connexion with the recent discovery in Austria of an elm disease believed to be identical with the die-back reported from various European countries, the writer briefly outlines the views of Brussoff and Wollenweber on this subject [see preceding abstracts]. Ilisch's method of immunization is to be tested at the Plant Protection Institute, but little hope of successful control on these lines is entertained.

GALLOT. **Note relative à la maladie des Ormes.** [Note relating to the Elm disease.]—*Bull. Soc. Centr. Forest. Belgique,* xxxv, 5, pp. 206–207, 1928.

Notes are given on the extension of the new elm disease in Belgium [*R.A.M.*, vi, p. 258], especially among wayside trees in the low-lying parts of the country. In some areas there are hardly any elms left. The relatively healthy condition of the elm plantations in elevated situations would seem to dispose of the theory

that the die-back originated in the severe winter of 1916, aggravated by the drought of 1921, since these climatic influences were fully as severe in such places as elsewhere. The disease is now beginning to invade a part of Hainault, which showed no sign of infection at the inspection of 1925–6. All varieties, e.g., the common, wych, and white elm [*Ulmus campestris*, *U. montana*, and (?) *U. fulva*], &c., appear to be equally susceptible. Recently a large number of forest elms have succumbed to die-back, showing that the disease is not confined to the waysides.

Report of the Division of Forestry.—*Ninth Ann. Rept. Dept. Conservation Indiana for year ending Sept. 30, 1927*, pp. 72–90, 1928.

Losses of 10 to 30 per cent. are reported from damping-off in pine and spruce [*Pythium de Baryanum*, *Fusarium*, &c.: *R.A.M.*, vi, p. 588]. Surfacing with heat-sterilized sand and burning wood and straw on the beds until the soil was deeply heated proved ineffective. A 2 per cent. solution of commercial formaldehyde applied at the rate of 2 galls. per half bed (50 sq. ft.) three days before sowing, with a burlap cover for the first of these days, seemed to control the disease in most beds but not in all. Bordeaux mixture 5–4–50 sprayed on the beds after germination apparently checked the disease somewhat. The use of top soil from native mixed oak and hickory [*Carya*] forest for the top inch or more of the seed-beds resulted in a marked decrease in damping-off.

Butt rot in a mixed oak and hickory woodlot was found serious in one-third of the trees and in one-fifth extended through the entire bole. This infection is attributed to fire scars. Plantations of white pine [*Pinus strobus*] suffered rather heavy mortality. The 'shoestring' fungus [*Armillaria mellea*] and an exceptional sleet storm which bent all conifers to the ground are both under suspicion as causes of death of the pines.

Chestnut blight spreads in southern States.—*Amer. Forests*, xxxiv, p. 240, 1928.

According to a report of the Bureau of Plant Industry, chestnut blight [*Endothia parasitica*] continues to spread rapidly in the southern United States, and is expected to kill most of the trees in the southern Appalachians within the next ten years [*R.A.M.*, vi, p. 214]. All the important chestnut-growing counties of Virginia, except 14 in the south-west, have 80 per cent. or more of the stand infected or killed by blight, while 21 counties of West Virginia, 7 of North Carolina, 2 of South Carolina, and 2 of Georgia are similarly affected. Of the remaining chestnut-growing counties in the above States, Tennessee and Kentucky, 69 have 30 to 79 per cent. infection; 62, 10 to 29 per cent.; and 23, less than 10 per cent. Owners are advised to ascertain whether the present condition of their trees is suitable for poles, in which case they should be cut promptly to prevent further loss. Stands for lumber may be left somewhat longer, but wood-rotting fungi cause decay of the bark and sapwood in a few years after blight infection.

Gard (M.). **Pourridié du Noyer cultivé (Juglans regia L.) et carbonate de chaux.** [Root rot of the cultivated Walnut (*Juglans regia* L.) and carbonate of lime.]—*Comptes rendus Acad. des Sciences*, clxxxvi, 20, pp. 1373–1375, 1928.

In this paper a table is given correlating the incidence of walnut root rot (*Armillariella* [*Armillaria*] *mellea*) [*R.A.M.*, v, p. 526; vi, pp. 200, 563] in various parts of France with the proportion of limestone in the soil, from which the author deduces that the spread of the disease in the last twenty years has been chiefly due to a progressive reduction in the lime content of the soil brought about by the use of chemical fertilizers. Laboratory investigations showed that the spores failed to germinate or germinated very poorly in a 0·13 per cent. solution of carbonate of lime. The disease is rare in soils containing 20 to 25 per cent. of lime, and absent in those with higher percentages except where the water-holding capacity of the soil has been permanently increased.

[This paper is also reprinted in the *Bull. Agric. Algérie-Tunisie-Maroc*, 2nd Ser., xxxiv, 5, pp. 91–93, 1928.]

European Larch canker (Dasyscypha calycina) in Rhode Island. —*Plant Disease Reporter*, xii, 1, p. 9, 1928.

Fresh outbreaks of European larch canker (*Dasyscypha calycina*) have been reported by the Office of Forest Pathology, Bureau of Plant Industry, from Rhode Island, where a number of 35-year-old Douglas fir [*Pseudotsuga taxifolia*] trees have been severely injured by the disease [*R.A.M.*, vii, p. 285]. The cankers are so numerous as to give the trunks a beaded appearance, and the branches are also extensively affected, many having been killed.

Oechslin (M.). **Die Verbreitung des Alpenrosenrostes, Chrysomyxa rhododendri, im Kanton Uri in den Sommern 1924–1926.** [The distribution of Alpine Rose rust, *Chrysomyxa rhododendri*, in the canton of Uri during the summers 1924 to 1926.]—*Schweiz. Zeitschr. für Forstwesen*, lxxviii, pp. 316–323, 1927. [Abs. in *Bot. Centralbl.*, N.F., xii, 13–14, p. 445, 1928.]

Spruce trees in the canton of Uri (Switzerland) have been suffering since 1924 from severe attacks of *Chrysomyxa rhododendri*, the alternate host of which is the Alpine rose [*Rhododendron ferrugineum*]. Infection almost invariably progresses downwards from the top of the tree to the lower branches. Although the chief centres of the disease are in the regions occupied by *R. ferrugineum*, it is noteworthy that individual trees have remained healthy in the midst of infected plantings of this host. Judging by the previous epidemics of 1901, 1911, and 1916, the rust may be expected gradually to decline in intensity.

Plassmann (E.). **Zum Tannensterben in der Eifel.** [On the die-back of Firs in the Eifel.]—*Zeitschr. für Forst- und Jagdwesen*, lx, 5, pp. 272–283, 4 figs., 1928.

Referring to Falck's theory of the etiology of the die-back of silver firs [*Abies pectinata*] in the Gemünd district of the Eifel [Rhine Province] as a 'chain' (successional) disease [*R.A.M.*, vii, pp. 349, 350], the author describes his own observations in the same

locality, which do not bear out the above hypothesis. The presence of *Aleurodiscus amorphus* and *Dasyscypha caliciformis* was constantly associated with the typical symptoms of die-back, but in every case examined they acted in a purely saprophytic capacity [cf. ibid., vii, p. 211] and were evidently secondary to the attacks of *Dreyfusia* [*Chermes*] *nuesslini*. This insect is considered to be undoubtedly the primary cause of the trouble, which cannot, therefore be averted by the elimination of the secondary fungi. The direct control of the insects by spraying is also regarded as impracticable.

HAWLEY (L. F.), FLECK (L. C.), & RICHARDS (C. A[UDREY]). **Effect of decay on the chemical composition of wood.**—*Indus. & Engin. Chem.*, xx, 5, pp. 504–507, 1928.

In the decay of the sapwood of two hardwoods, namely, red oak (*Quercus borealis*) [*Q. coccinea*] and white oak (*Q. alba*), and two softwoods, viz., white spruce (*Picea glauca*) and southern cypress (*Taxodium distichum*), caused by *Polystictus hirsutus* and *Lenzites striata*, the pentosans were among the first constituents attacked, and at all stages of rotting they were removed more rapidly, in proportion to the amount present, than the hexosans.

Both the stable and the readily hydrolysed portions of the cellulose were uniformly attacked, but in most cases there was a preferential attack on the former.

Although all the white rot fungi are supposed to attack lignin in preference to cellulose [*R.A.M.*, vii, p. 291], *P. hirsutus*, a representative of this group, behaved like the typical brown rot fungus, *L. striata*, at any rate in the early stages of decay.

The two softwoods contained a larger amount of stable cellulose than the hardwoods (44 compared with 39 per cent.), and in the former a greater proportion of the pentosans in the cellulose remains unhydrolysed (about one-third), than in the latter (about one-fifth).

DEHNST. **Über den Mechanismus des Holzschutzes durch Konservierungsmittel.** [On the mechanism of timber protection by preservatives.]—*Zeitschr. Angew. Chemie*, xli, 14, pp. 355–358, 1 fig., 1928.

In order to test the correctness of Bateman's theory that the toxicity of coal-tar oil is due to the presence of low-boiling hydrocarbons and high-boiling tar bases and acids [*R.A.M.*, v, p. 398], the writer conducted a series of similar experiments [the technique of which is fully described]. In addition to Bateman's test fungus, *Fomes annosus*, which is not a satisfactory standard since it is almost exclusively confined to living wood and therefore of little importance in the decay of structural timbers *Coniophora cerebella*, *Polyporus vaporarius* [*Poria vaporaria*], and *Lenzites abietina* were exposed to the action of (*a*) coal-tar oil containing 14 per cent. acid and 5 per cent. basic oils, and (*b*) the same oil deprived of various components.

It was found that the toxicity of the oil towards *C. cerebella* was not reduced by the consecutive withdrawal of tar acids, tar bases, crude anthracene, the oils with a boiling-point of up to 285° C., and

the water-soluble bodies. Oil (*a*) was equally toxic towards all four organisms tested, but the depleted oil was efficacious only against *C. cerebella* and *P. vaporaria*. The toxicity of coal-tar oil towards *F. annosus* and *L. abietina* does, therefore, depend on the presence of tar acids and bases, but it is misleading to apply this statement to wood-destroying fungi in general, since the other two organisms used were equally sensitive to the action of the oil in a 'barren' state [ibid., iii, p. 617].

DUCOMET (V.). **La cercosporiose de la Betterave.** [Cercosporiosis of Beet.]—*Rev. Path. Vég. et Ent. Agric.*, xv, 4–5, pp. 110–120, 1 graph, 1928.

It is stated that *Cercospora beticola* is sometimes serious on sugar beets in the north of France, but is more common on forage beets in the south-western regions, where it may become very prevalent at the beginning of August.

During 1928, in the course of manurial trials conducted in the Seine-et-Marne region, *C. beticola* was least severe in plots heavily dressed with potash or ammoniacal nitrogen, but this, it is thought, may be due merely to the delayed maturity resulting from the treatment. Beets physiologically weakened by unsuitable conditions appear to be the most severely attacked.

Observations [which are tabulated and expressed graphically] made during 1927 in the region of the Aisne upon healthy and diseased beets grown from the same seed plant, showed that the disease reduced the average sugar content from 17 to 16 per cent. (a reduction of 5·8 per cent.), and that small beets tended to be less affected than large ones.

The paper terminates with a discussion of various methods of control, with reference to the work of Garbowski [*R.A.M.*, vii, p. 356] and others; the author considers that efforts should be made to discover resistant varieties by artificial infection experiments.

GLEISBERG (W.). **Zum Reichspflanzenschutzgesetz.** [On the State Plant Protection Law.]—*Zeitschr. für Pflanzenkrankh. und Pflanzenschutz*, xxxviii, 5–6, pp. 133–136, 1928.

Referring to Prof. v. Tubeuf's suggestions concerning the restriction of importation of plants into Germany with a view to preventing the spread of diseases [*R.A.M.*, vii, p. 482], the writer thinks that undue importance has been attached to this method of dissemination. The establishment of a 'zone of protection' to prevent the infection of nursery gardens and the like from external sources is considered to be more desirable than the adoption of far-reaching legislative measures.

In a reply to this article (pp. 136–138), Prof. v. Tubeuf criticizes Prof. Gleisberg's statements and recapitulates his demand for the restriction of import facilities as the only means of ensuring adequate protection.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW
OF
APPLIED MYCOLOGY

Vol. VII NOVEMBER 1928

Liese (J.). **Verhalten holzzerstörender Pilze gegenüber verschiedenen Holzarten und Giftstoffe.** [Reaction of wood-destroying fungi towards the various kinds of timber and toxic substances.]—*Angew. Bot.*, x, 2, pp. 156–170, 3 figs., 1928.

The writer carried out a series of laboratory experiments [the technique and results of which are fully described] to determine the action of 19 parasitic and saprophytic fungi on different kinds of wood, and also to ascertain the effect on two of the organisms of various toxic compounds used in timber preservation.

Trametes pini caused very slight damage to pine blocks exposed to its action under humid conditions for four months, and none to alder [*Alnus*]. This fungus is known to make very slow progress in the destruction of living pine wood and has never been observed to attack structural timber.

Polyporus [*Fomes*] *annosus* also caused relatively little decay of the wood blocks used in these tests. It appears to prefer fir wood and the loose wood of pine roots, attacking the wood of pine trunks only after a lengthy exposure to damp conditions, e.g., in mines. The habitual use of this fungus in trials of wood preservatives in the United States does not, therefore, seem justifiable [*R.A.M.*, vii, p. 687].

P. [*F.*] *fomentarius* caused an extensive decay of the beech wood blocks, which lost 23·1 per cent. of their original weight during the four months of the tests. Slight infection of pine sapwood and oak was also observed.

P. sulphureus attacked the oak blocks more severely than any of the other fungi used (16 per cent. loss of weight), the corresponding figures for beech, alder, and pine sapwood being 15, 14, and 6·7 per cent., respectively.

P. betulinus, found in nature exclusively on birches, caused an intensive decay of beech and pine sapwood (41 and 32 per cent. loss of weight, respectively); while alder and oak were also attacked to a lesser extent (14 and 7·2 per cent.).

P. adustus, *P.* [*Polystictus*] *zonatus*, and *Polyporus brumalis* all proved capable of destroying pine wood, though the rotting was less extensive than in the deciduous species. *Polystictus zonatus*

caused a loss of 43 per cent. in the weight of the beech blocks and of 33·5 per cent. in the alder. *Polyporus helveolus, Placodes* [*F.*] *ungulatus*, and *T.* [? *F.*] *pinicola* were also responsible for severe injury to beech (35, 36, and 35 per cent. loss of weight, respectively), and pine sapwood (18, 40, and 40·2 per cent.).

Lentinus lepideus is one of the most important agents of decay in the non-impregnable heartwood of pine. In the writer's preliminary tests the fungus caused only 16 per cent. loss of weight in pine heartwood.

Lenzites abietina and *L. sepiaria* caused 21 and 13 per cent. loss of weight, respectively, in pine sapwood (36 per cent. with a highly virulent strain of the former): *L. sepiaria* also attacked beech wood (11 per cent.).

The percentage loss of weight caused by *Coniophora cerebella* [ibid., iv, p. 628] in pine sapwood, pine heartwood, beech, and oak was 34 (51 with a particularly virulent strain), 25, 33, and 6, respectively. No difference in respect of the intensity of infection was observed between saturated and unsaturated wood.

Poria vaporaria caused 31 to 37 per cent. loss of weight in pine sapwood (44 per cent. with an extra virulent strain), 30 per cent. in pine heartwood, and 37 per cent. in beech.

Merulius domesticus [*M. lacrymans*] attacked pine sapwood most severely (44 per cent. loss of weight), the corresponding figures for pine heartwood, beech, oak, and alder being 8, 34, 2, and 30 per cent. *M. silvester* [ibid., vii, p. 292] was much less destructive (26, 6, and 6·7 per cent. loss of weight in pine sapwood, pine heartwood, and beech blocks, respectively).

Of the fungi used in these experiments, only *T. pini* and *F. annosus* belong to the so-called 'corrosion' group [ibid., vii, p. 68], all the others being of the 'destruction' type and causing the disintegration of cellulose. The lignin content of the blocks after attack by *L. abietina*, *C. cerebella*, and *P. vaporaria* ranged from 50 to 70 per cent. compared with 28 to 30 per cent. in sound wood.

An outstanding feature of the data obtained in these tests is the general high level of resistance to infection in oak and pine heartwood. Untreated oak railway sleepers have remained unimpaired by fungous infection for 12 to 15 years.

In a series of test tube experiments to determine the action of various standard preservatives on *C. cerebella* and *P. vaporaria*, thanalith (a combination of arsenic, fluoride, and dinitro compounds) inhibited the growth of the former at 0·01 and that of the latter at 0·022 per cent. The corresponding figures for copper sulphate were 0·3 and 0·9 per cent.; zinc chloride 0·45 and 0·75 per cent.; sodium fluoride 0·02 and dinitrophenol aniline 0·005 per cent., respectively, for both fungi; and basilite [ibid., vii, p. 212], triolith, and manelite (all consisting of 70 to 80 per cent. sodium fluoride and generally 10 per cent. of a dinitro compound), 0·02 per cent. for both organisms.

Liese (J.). **Holzschutz gegen Pilze im Walde.** [Protection of timber against fungi in the forest.]—*Zeitschr. für Forst- und Jagdwesen*, lx, 5, pp. 287–296, 1928.

Most of the fungi enumerated in this paper as causing damage to

felled timber in the forest have been more fully described in the writer's article on the reaction of wood-destroying organisms towards various kinds of trees [see preceding abstract]. Directions are given for the control of the different types of decay by improved silvicultural measures, supplemented where necessary and practicable by chemical treatment on the lines advocated by Schwalbe [*R.A.M.*, vi, p. 647]. The so-called red or false heart of beech caused by *Stereum purpureum* and other fungi is briefly described. The tyloses formed in the central region of the trunk render the wood heavier than usual, and its resistance to wood-destroying fungi is temporarily intensified; this condition, however, is gradually superseded by a white rot. Beech logs showing more than one-sixth of the entire cross-sectional area infected by *S. purpureum* are not accepted by German railway companies.

KINDSHOVEN [J.]. **Entseuchung des Bodens und Bekämpfung der Kohlhernie mit Kalkstickstoff.** [Soil disinfection and control of club-root of Cabbage with calcium cyanamide.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xliii, 22, pp. 522–523, 3 figs., 1928.

The writer recommends, as the result of his extended investigations on the control of club-root of cabbage [*Plasmodiophora brassicae*: *R.A.M.*, iii, p. 625], the use of calcium cyanamide as an alternative to lime in the disinfection of the soil ($\frac{1}{4}$ kg. per cu. m.), and as a constituent of the mineral fertilizer (450 to 500 kg. per hect. each of calcium cyanamide, basic slag, and potassium salt).

SEVERIN (H. H. P.). **Crops naturally infected with Sugar Beet curly-top.**—*Science*, N.S., lxvi, 1701, pp. 137–138, 1927.

Curly top of sugar beets [*R.A.M.*, vii, p. 136], transmitted by the beet leafhopper *Eutettix tenella*, is stated to have caused such enormous losses in certain western areas of the United States that in many places the industry is threatened with extinction. When an outbreak occurs other crops in the vicinity may also be severely attacked by the same disease. In 1919 and 1925 curly top caused serious damage to sugar beet in the San Joaquin and Sacramento Valleys and in the same years western yellow blight destroyed most of the tomato crop in the same valleys. Both diseases are most severe in the natural breeding grounds of the leafhopper. During 1925 and 1926 non-infective leafhoppers fed on tomato plants affected with western yellow blight transmitted curly top to sugar beets [cf. ibid., vii, p. 478] and curly top was also transmitted from tomatoes showing only symptoms of mosaic.

A list is given of other crops which have been found by similar cross-inoculation experiments to be actually infected with curly top in California; it includes mangold, spinach, bean (*Phaseolus vulgaris*), Lima bean (*P. lunatus*), cowpea (*Vigna sinensis*), lucerne, squashes (*Cucurbita* spp.), watermelon, cucumber, cantaloupe, potato, *Capsicum* spp., horseradish, radish, cabbage, turnip, and parsley.

WILLE (J.). **Die durch die Rübenblattwanze erzeugte Kräuselkrankheit der Rüben. Beobachtungen und Infektionsversuche, sowie Vergleiche mit der nordamerikanischen curly-leaf-Krankheit.** [The curl disease of Beets caused by the Beet leaf bug. Observations and inoculation experiments, as well as comparisons with the North American curly leaf disease.]—*Arb. Biol. Reichsanst. für Land- und Forstwirtsch.*, xvi, 1, pp. 115–167, 6 figs., 1 graph, 1 map, 1928.

Since the first record in 1910 of the curl disease of beets in Germany, the damage due to this cause has steadily increased. The author here discusses and tabulates the results of his extensive investigations on it at Aschersleben [Saxony].

The only method by which the disease is produced in nature is by the leaf bug *Piesma quadrata* [*Zosmenus quadratus*] and in its etiology the disease shows close analogy with the formidable curly top of the United States [see preceding abstract].

The development of leaf bug curl depends on the number of sucking insects, the duration of the sucking, and the age of plants visited; on the other hand, it is immaterial which parts of the plants are attacked. Ten bugs sucking for two hours, or three for 24 hours, will produce severe symptoms of curl in seedlings. The number of insects is of greater importance in the development of the disease than the duration of sucking. Beet plants have been found susceptible to curl until the development of five pairs of leaves, but it appears impossible to produce the symptoms in older plants and two-year-old beets.

Inoculation experiments carried out at fixed intervals showed that the plants acquire no active immunity: on the contrary, intense progressive aggravation of the symptoms was observed.

The symptoms are classified as primary and secondary, the development of the latter occurring after an incubation period of varying duration. Primary symptoms are pale puncture spots, reduction of turgor, and premature death. The numerous secondary symptoms include swelling, glassiness, and distortion of the leaf veins and petioles; inflation of the leaf parenchyma with consequent curling; curtailment and bending inwards of the petioles, imparting a lettuce-head appearance to the plants; arrested growth, especially of the 'root'; withering of the older leaves; conical projection of the growing point; the formation of numerous small lateral roots on both sides of the main one; and premature death. The loss in weight resulting from curl disease may amount to nearly 100 per cent.

Three common forms of the disease and one (or possibly two) rarer ones are differentiated and described. The occurrence of one or another form is directly dependent on the incubation period, the number of insects, the duration of sucking, and the prevailing temperature. For the development of the most severe form the temperature during the sucking period (24 hours) must attain a maximum of at least 12° C., with a minimum of not less than 5°. On the other hand, the influence of humidity, soil conditions, and fertilizers is only secondary.

Spontaneous individual immunity from leaf bug curl was observed, but there was no case of varietal immunity among the 15 sorts of sugar and fodder beets used in the tests.

Wild Chenopodiaceae do not appear to contract the secondary symptoms. Preliminary tests indicate the possibility of transmitting the disease to bush beans [*Phaseolus vulgaris*: cf. ibid., v, p. 272].

The disease was shown to be transmissible by originally non-infective bugs fed on curled leaves and also by the juice from diseased plants. The conclusion is therefore reached that beet leaf curl is a virus disease and not a chemico-toxic phenomenon, and this is also supported by the fact that certain individuals failed to transmit the disease. The curl virus overwinters not only in the insects but also in the diseased beets.

In a comparative survey of the literature on German leaf bug curl and the American curly top, attention is drawn to the parallels and differences existing between these two diseases. Recent experiments conducted by the Anhalt Chamber of Agriculture have shown that American beets resistant to curly top are highly susceptible to the German leaf bug curl, indicating a distinction between the respective viruses.

Pending the development of resistant varieties, the extermination of the insects by chemical and other means [which are described] is considered to be the only feasible measure of control.

Mouravieff (V. P.). Церкоспориоз Сахарной свеклы по наблюдениям на Мироновской Опытно-Селекционной Станции. [Cercosporosis of the Sugar Beet in the light of the observations made at the Mironovka Experimental Plant Breeding Station.] —*Труды Мироновской Опытно-Селекционной Станции. Отд. Фитопатологии* [*Trans. Mironovka Exper. Plant Breeding Stat., Phytopath. Sect.*], *1927*, 1, pp. 3–40, 3 graphs., 1927. [Received July, 1928.]

This is a detailed account of field observations and experiments made from 1924 to 1927, inclusive, at the Experimental Plant Breeding Station of Mironovka [Ukraine] with a view to determining the environmental conditions which, in certain years, lead to epidemic outbreaks of sugar beet leaf blight (*Cercospora beticola*), a disease that is stated to occur normally to a slight degree every year over the whole of the Ukraine without causing appreciable damage to the crop [*R.A.M.*, vii, p. 554].

A study of the meteorological factors in 1913 and 1925, in which years the sugar beet crops were severely attacked, leads the author to believe that epidemics are largely caused by cold weather in June, followed by warm and damp conditions in July and August. A cold spell in the first half of June, at the time when the beet leaves begin to attain their full development, favours primary infection of the plants with spores that overwinter on dead leaves of the previous season, by lowering the natural resistance of the young leaves; while self-sown beet seedlings may sometimes be found in the autumn or early spring bearing well-defined *C. beticola* spots on their immature leaves. Once the infection is established, its epidemic spread is ensured by warm and rainy weather in the following two months, which favours a rapid and abundant formation of conidia. In 1925, the epidemic attained its maximum intensity towards the beginning of August, after which it gradually died

down, presumably owing to the cooler weather that set in. The beets then threw out new foliage and appeared fairly healthy at harvest time, but their yield in sugar was considerably lowered, as well as their keeping qualities in storage.

The importance of dead beet leaves in the soil as a source of primary infection was fully demonstrated in a series of experiments [details of which are given]. In further experiments it was shown that the intensity of the attack was appreciably reduced by liberal applications of farmyard manure, while heavy doses of mineral fertilizers, irrespective of their composition, tended to increase it. The effect of smaller doses of fertilizers varied with the composition of the latter; it was noticed, in particular, that lack of potash or excess of nitrogen and phosphates favoured the development of the disease. The highest incidence of the leaf blight occurred in plots sown to beet several years consecutively, and decreased in direct proportion to the lengthening of the crop-rotation period.

Besides the direct injury caused to the plants by *C. beticola*, consequent on the severe interference with the normal assimilation by the foliage, the disease adversely affects the yield in sugar of the beets by inducing the latter in early autumn, when the infection dies down under the influence of the cold weather, to throw out new leaves at the expense of the reserves stored in the roots; this also leads to a lowering of the keeping quality of the roots in storage, since they are then harvested while still in full vegetative activity.

Although, in the author's opinion, there is no true varietal resistance of beet to *C. beticola*, on account of the great variability in the offspring of beet seed, experiments showed that when resistant individuals were propagated vegetatively by grafting their crowns each year on young roots, they produced seed which yielded uniformly resistant progeny, and it is believed that on these lines a resistant line of beet may ultimately be evolved.

SCHMIDT (E. W.). **Untersuchungen über die Cercospora-Blattfleckenkrankheit der Zuckerrübe.** [Investigation on the *Cercospora* leaf spot disease of the Sugar Beet.]—*Zeitschr. für Parasitenkunde*, i, 1, pp. 100–137, 3 figs., 1 graph, 1928.

The results of the author's cultural and morphological studies on the causal organism of leaf spot of beets (*Cercospora beticola*) [see preceding abstract] are fully described.

The fungus does not form biological strains, but the forms originating in various countries (Italy, Rumania, America, Japan, and Germany) showed certain cultural differences on an agar medium with 1 per cent. cane sugar. Thus, the mycelium of the European forms was dark olive-green (flecked with white in the German material), while that of the American strains (which grew less vigorously than the Italian and Rumanian) was ivory-white, later orange-yellow; in two Japanese forms the mycelia were brownish and very dark brown, respectively. These differences are relatively constant only in young cultures.

The number and length of the spores of *C. beticola* (which lost their viability within six months), were found to depend on the degree of relative atmospheric humidity, as was also their germina-

bility, 99 per cent. being necessary for rapid and uniform germination at room temperature, while at 97 per cent. no germination occurred. Germination took place in the freshly expressed juice of a number of plants.

The penetration of the stomata of the living beet leaves by the germ-tubes of *C. beticola* is thought to depend on hydrotropism. No correlation was found between susceptibility and the size and number of stomata in the leaves.

The lesions produced on beet leaves by *C. beticola* are bounded by a layer of metacutinized cells with a suberized zone.

Artificial epidemics of leaf spot may be induced by the wholesale inoculation of the plants in greenhouse or field with spore suspensions of the fungus, applied by a sprayer. High temperatures (at least 20° C.), coupled with high relative humidity, are essential to the development of an epidemic.

The spores of *C. beticola* were found to be fairly resistant to the action of copper, isolated germination occurring in 0·5 per cent. solutions of copper sulphate and 2 per cent. Bordeaux mixture. Spraying for the control of leaf spot should, therefore, be carried out before the weather conditions become favourable to the abundant production of spores (earlier than 1st July as a rule).

Artificial inoculation experiments on orache [*Atriplex*], stinging nettles [*Urtica dioica*], *Atropa belladonna*, and *Tropaeolum majus* gave positive results. Passing through stinging nettle leaves failed to reduce the virulence of *C. beticola* towards sugar beet leaves.

SAILLARD (G.). **Production de graines de Betteraves, de Betteraves et de sucre en 1927.** [Production of Beet seed, Beetroots, and sugar in 1927.]—*Comptes rendus Acad. d'Agric. de France*, xiv, 14–15, pp. 522–539, 1928.

In connexion with this study on beet production in France during 1927, the author gives an account of the leaf spot caused by *Cercospora beticola*, and of its distribution in various parts of Europe [see *R.A.M.*, vii, p. 688 and preceding abstracts].

The disease first attracted attention in France during 1915, especially in the fields of seed-bearers near the fighting-line. The affected plants gave the poorest yield on record, and the beets showed an unusually high nitrogen content.

Many growers are of opinion that leaf spot is transmitted by the seed-bearers, but in Italy, at any rate, this method of propagation is not practised, so that another explanation must be sought. A number of French and foreign plant-breeding firms are now experimenting in the possibility of control by means of seed-cluster disinfection. It is also possible that insects and driving rain may be responsible to some extent for the spread of infection. In connexion with the study of this important problem, the (French) Beetroot Seed Commission has resolved to offer a prize for the best memoir on French and foreign literature relating to beetroot diseases in general and to leaf spot in particular; to arrange for tours of investigation through the countries of western and central Europe in 1928, with a view to collecting information on the propagation

effects, and treatment of the disease; and to publish a pamphlet with plates and figures on beetroot diseases.

Erfahrungen bei einem Rübenbeizversuch im letzten Jahre. [Data obtained in a Beet disinfection experiment during the last year.]—*Landw. Zeit. für Westfalen und Lippe*, 9, 3rd March, 1927. [Abs. in *Nachricht. über Schädlingsbekämpf.*, iii, 1, pp. 10–12, 1928.]

A brief account is given of a series of co-operative experiments in the disinfection of beet seed against root rot [*Phoma betae*, *Pythium de Baryanum*, and *Aphanomyces levis*] carried out in 1926. The best results were given by dusting with tillantin R and tillantin (8 per mille), which increased the yield of the treated plots by 23 and 24 per cent., respectively. Uspulun (liquid) and four unnamed liquid preparations (0·25 per cent.) also proved very satisfactory. The advantages of dusting as compared with the liquid method of treatment are briefly outlined.

NATTRASS (R. M.). **Onion immunity trials—1927.**—*Ann. Rept. Agric. & Hort. Res. Stat., Long Ashton, Bristol, for 1927*, p. 106, [1928].

In further experiments upon varietal resistance of onions to white rot (*Sclerotium cepivorum*) [*R.A.M.*, vi, p. 592], seed was sown on infected land near Bristol during August, 1926, and the percentages of diseased bulbs lifted in June, 1927, were as follows: Italian Tripoli 11·4, Lemon Rocco 4·3, Globe Tripoli 13·9, White Welsh 29, White Globe 8·6, and White Lisbon 25.

OGILVIE (L.). **Late spraying of Celery.**—*Agric. Bull. Dept. of Agric. Bermuda*, vii, 5, p. 4, 1928.

Burgundy mixture is recommended as a substitute for Bordeaux in the late spraying of celery [against *Septoria apii*: *R.A.M.*, vi, p. 15], since it does not discolour the plants so badly.

JONES (H. A.) & ROBBINS (W. W.). **The Asparagus industry in California.**—*California Agric. Exper. Stat. Bull.* 446, pp. 3–105, 43 figs., 1928.

The section of this bulletin (pp. 89–96) dealing with the fungous diseases of asparagus in California contains descriptive notes on rust (*Puccinia asparagi*) and violet root rot (*Rhizoctonia crocorum* var. *asparagi*) [*R.A.M.*, vi, p. 710; vii, p. 5]. The life-history, symptoms, and environmental relations of the first-named disease are discussed in some detail, with observations on its control by the use of the resistant varieties, Martha and Mary Washington; two applications of sulphur dust (25 to 30 lb. per acre three weeks after cutting and again about a month later); and the usual cultural measures.

SUNDARARAMAN (S.). **The 'clump disease' of Groundnuts.**—*Madras Agric. Dept. Year Book 1926*, pp. 13–14, 1927. [Received 1928.]

A peculiar disease of groundnuts (*Arachis hypogaea*), known as 'clump', has recently been observed at the Palur Agricultural

Experiment Station, Madras. Affected plants are characterized by a dense clump of tufty, dwarfed shoots with yellowed leaves, and by an erect habit of growth instead of the usual spreading one. Development is arrested at an early stage and the yield is much reduced. No evidence of any parasitic infection was obtained. Local growers attribute the condition (which only occurs sporadically) to a poor state of the soil and to the use of immature seed. All the twenty varieties cultivated at the Station are susceptible, especially Barbados, Ceylon, Carolina, several types of Mauritius and Virginia, Senegal, Transvaal, and West African. [This disease is stated by Storey and Miss Bottomley to be, from its description, closely similar to groundnut rosette : *R.A.M.*, vii, p. 486.]

CAMBONIE (L.). **La défense du vignoble contre le mildiou en Aveyron.** [The protection of the vineyard from mildew in Aveyron.]—*Prog. Agric. et Vitic.*, lxxxix, 26, pp. 629–631, 1928.

During 1927, many vineyards in the department of Aveyron were attacked by mildew [*Plasmopara viticola*] even after ten applications of Bordeaux mixture, but vines treated with copper dusts [*R.A.M.*, vii, pp. 74, 219] remained unaffected. The use of these dusts is advised in particular whenever the brown rot symptoms [on the fruit] are present, Bordeaux mixture being employed solely to protect the foliage.

As a result of comparative tests during 1925–27, the author recommends wettable cupric sulphur dusts [ibid., vii, p. 74] in preference to the dusts ordinarily used, since the former are as finely divided as the best steatites, are more adherent than any other similar dusts, are exceedingly effective, and permit of treating both *P. viticola* and *Oidium* [*Uncinula necator*] at the same time.

In Aveyron, Bordeaux mixture should be used from 15th May during the entire vegetative period, while dust should be applied both just before and at flowering time, subsequent applications alternating with liquid treatments until the end of July or early August, if the weather favours infection.

Aus dem Pflanzenschutzdienst. [From the Plant Protection Service.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, viii, 4, p. 33, 1928.

In the experiments conducted by the German Plant Protection Service, nosprasit (I. G. Farbenindustrie A.G., Leverkusen) gave valuable results in the control of vine downy mildew (*Peronospora*) [*Plasmopara viticola*] and the moths [*Clysia ambiguella* and *Polychrosis botrana*: *R.A.M.*, vii, p. 489].

OSTERWALDER (A.) & SCHELLENBERG (H.). **Ueber den falschen Meltau und den Rotbrenner der Reben und die Bekämpfung dieser Krankheiten.** [On downy mildew and rotbrenner of Vines and the control of these diseases.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxvii, 10, pp. 172–176, 1928.

The life-histories of downy mildew and rotbrenner of the vine (*Plasmopara viticola* and *Pseudopeziza tracheiphila*) and the

symptoms caused by these organisms are described in popular terms, with special reference to Swiss conditions, and full directions are given for their control by the application of 1·5 to 2·5 per cent. Bordeaux mixture [*R.A.M.*, vii, p. 358]. Copper sulphate and lime is also put on the market in packet form under the names kukaka (Maag, Dielsdorf) and cupra (Comptoir des Produits Cupriques, Cortaillod), both of which contain a casein adhesive added to the lime.

Röder (W.). **Schädlingsbekämpfung im Weinbau im Jahre 1927 und die sich daraus ergebenden Lehren für die Praxis.** [Pest control in viticulture in the year 1927 and the practical applications arising therefrom.]—*Nachricht. über Schädlingsbekämpf.*, iii, 1, pp. 20–21, 1928.

This is the author's abstract of a paper which originally appeared in *Landw. Zeitschr. für die Rheinprovinz* (Bonn), 52, 23rd December, 1927. Thanks to the systematic campaign against roter brenner of the vine [*Pseudopeziza tracheiphila*] in the Moselle Valley, the damage from this source has been greatly reduced during the last two years [*R.A.M.*, vii, p. 358]. Bordeaux mixture, when used for the early applications, is liable to cause burning, and should be replaced by nosperal (or nosprasen if insects are already in evidence) at a strength of 1 or 1·5 per cent. The dusts nosperit and nosprasit are also effective and cause no burning [but see ibid., vii, p. 138]. Good control of *Peronospora* [*Plasmopara viticola*] was obtained during 1927 by the application of Bordeaux mixture at a strength not exceeding 1·5 per cent., this being sufficient for the most critical situations. Nosperal, nosprasen (1·5 to 2 per cent.), nosperit, and nosprasit also proved effective.

Viala (P.) & Marsais (P.). **Scléríase des Raisins (Sordaria uvicola, sp. nov.).** [Scleriasis of Grapes (*Sordaria uvicola* sp. nov.).]—*Ann. Inst. Nat. Agron.*, xx, pp. 76–135, 52 figs., 1927.

The authors give a full account of a disease of grapes which was first recorded in the district of Chisinau (Kishineff), Bessarabia, in 1922, where it has since been reported to have spread considerably though it has not been recorded elsewhere. The information has been derived from material sent from Bessarabia and from reports supplied by the Station Bio-entomologique de Chisinau. The disease is stated to have caused particularly heavy losses in the last three years, presumably owing to the succession of dry seasons which led many of the growers to neglect the treatment of the vines against mildew. The attack is almost entirely restricted to white varieties of grapes, and only occurs after the fruit has reached complete maturity.

Affected grapes become wrinkled and dry up within a few days. At the same time their colour deepens to reddish-brown, and finally they turn black; on closer examination it is seen, however, that the black pigmentation is not uniform, being more intense on the crests of the wrinkles; between these the cuticle is cracked and the juice exudes. The tissues bordering the cracks contain large numbers of black sclerotia. The sclerotia arise from a subcuticular mycelium

which never penetrates the pulp. On the surface of the fruit the fungus produces conidia of the *Alternaria* type and also pycnidia; the *Alternaria* may occasionally be found on the older leaves of the vine.

The causal fungus isolated from diseased grapes formed perithecia very freely in culture in addition to the sclerotia, pycnidia, and *Alternaria* conidia. The mycelium was of two types, one with narrow hyphae not exceeding 3 μ in diameter and a larger form with hyphae 7 to 20 μ and the perithecia were only formed when both kinds were present. The large type gave rise to *Alternaria* conidia very similar to those of *A. vitis* Cavara, and 22 to 55 by 6 to 14 μ in diameter. The narrow mycelium developed black spherical pycnidia, 280 to 300 μ in diameter, containing olivaceous pycnospores which were pointed at the ends and measured 10 by 6 μ. The perithecia are intensely black, pyriform, about 320 μ across and up to 570 μ high, with a neck very variable in length and sometimes reduced to a slight protuberance at the apex. The asci are uniseriate and paraphysate, 140 to 160 μ long apart from the pedicel. The ascospores are ovate and measure 20 to 22 by 12 to 13 μ. The species is regarded as a new species of *Sordaria* and is named *S. uvicola*, but without any technical diagnosis.

The authors regard the large type of mycelium (macrothallus) as of the female sex and figure the fusion of the fine mycelium (microthallus) with it to give rise to the perithecium. Both types of mycelium are stated to belong indisputably to the same species and the relationship of the other fructifications to this fungus is regarded as established by the cultures. Notes on the cultural characters of the fungus are also given.

The extreme rapidity of growth in cultures leads the authors to believe that, given favourable conditions, the fungus might become a dangerous parasite in France, if introduced. Some recommendations for the possible control of the disease are tentatively made, chiefly based on the fact that in Bessarabia it became a serious disease when the vineyards were very inadequately treated against mildew.

[An abbreviated account of this work is also given by the authors in *Rev. de Vitic.*, lxviii, 1764, pp. 249–254, 2 figs., 1928.]

JØRSTAD (I.). **Beretning om plantesykdommer i land- og hagebruket. V. Hagebrukets nyttevekster.** [Report on plant diseases in agriculture and horticulture. V. Economic horticultural plants.]—Oslo, Grøndahl & Søns Boktrykkeri, 68 pp., 1928.

This report contains extensive notes on the occurrence of the more serious diseases of fruit and vegetables in Norway, besides giving a very complete survey of the fungi parasitic on these crops in the country. Among many other interesting records the following may be mentioned. *Coryneum microstictum* produces canker-like wounds on young apple branches, on which *Valsa melastoma*, *Tympanis conspersa*, *Sclerophoma mali* [also known as *Myxosporium mali*: *R.A.M.*, i, p. 63; iv, p. 589], *Diplodia pseudodiplodia* [*Physalospora cydoniae*: see also ibid., vi,

p. 423], and *Phomopsis mali* (the pycnidial stage of *Diaporthe perniciosa*) [ibid., iv, p. 174] occur as saprophytes. *Polyporus varius* has twice been found on living apple trunks but its parasitism is considered doubtful. *Phacidiella discolor*, which is stated to be identical with *Pyrenochaete furfuracea* [ibid., vi, p. 336], has been found causing a dry black rot of stored Signe Tillisch apples [ibid., vii, p. 585].

The only leaf spots of pear hitherto reported in Norway are those due to *Entomosporium maculatum* [*Fabraea maculata*]. *Hendersonia piricola* (probably identical with the above-mentioned *C. microstictum*), and *Phyllosticta pirina* [ibid, iv, p. 419]. No wood-rotting fungi are definitely known to attack pears, but in one case *Stereum rugosum* was observed in a form suggestive of parasitism.

Reversion of black currants [ibid., vii, p. 383] is widespread in the coastal districts, especially Rogaland, where it constitutes a real danger to the crop. The disease was first recognized in Norway in 1922, having probably been formerly confused with the symptoms of attack by the big bud mite (*Eriophyes ribis*). In Hordaland and northwards no correlation has been detected between the occurrence of reversion and the attacks of *E. ribis*, but in the south-west the connexion between the two conditions appears to be fairly constant. The spread of reversion was studied from 1924 to 1927, when it was found that the number of infected Bang Up bushes had increased from 34 to 49 (out of a total of 168), and of Lee's Prolific from 1 to 6 (total 125), while the figure for Boskoop remained stationary at 14 out of 186. No big bud mites were present in this plantation, and it is uncertain whether the infection was transmitted by sucking insects or by pruning implements.

Raspberry leaves are frequently attacked by *Coleroa chaetomium*, and *Septoria rubi* has also been recorded on this host. *Coryneum microstictum*, a species of *Neonectria*, and *Phoma idaei* occur as facultative parasites on raspberry canes. The callus disease of raspberries, associated with *Bacterium tumefaciens* [ibid., vi, p. 740], was first reported in Norway in 1907, and has caused considerable damage during the period under review (1923 to 1927). *Fusarium salicis* and *F. herbarum* are frequently found in conjunction with the crown gall organism. Raspberry mosaic, first observed in 1908, is very prevalent, especially on the Marlboro variety. Varietal reaction to the disease apparently fluctuates with the different meteorological and soil conditions, Marlboro being particularly susceptible in acid soils and during seasons when the early summer is dry.

Phyllosticta grandimaculans was found in June, 1924, on overwintered leaves of strawberry plants which were dying of a wilt disease characterized by drooping and red discoloration of the foliage. This condition, which was prevalent in Østlandet during 1920–22 and has since caused considerable damage in various districts, is believed to be of parasitic origin and may be identical with the disease known in England as 'sudden wilt' [ibid., vii, p. 181]. A very similar condition affecting rhubarb is tentatively ascribed to a bacterium.

Tomatoes are attacked by various leaf spots, including those due

to *Septoria lycopersici* and *Alternaria solani*, the latter causing serious damage.

Cucumber leaves are liable to infection by a species of *Alternaria* (possibly identical with the fungus sometimes termed *Sporodesmium mucosum* var. *pluriseptatum*) [ibid., v, p. 70], which causes symptoms somewhat resembling those due to *Corynespora melonis* [ibid., vii, p. 6] but less serious.

Leeks are attacked by a bacterial soft rot and by *Macrosporium parasiticum* [ibid., vi, p. 538], and are also subject to a storage rot associated with *Aspergillus niger*.

Leaf spot of parsnips (*Ramularia pastinacae*) was recorded for the first time in Norway during 1927.

Typhula gyrans has been found on outdoor cabbages during the winter, producing masses of round, dark-coloured sclerotia, generally not exceeding 1·5 mm. in diameter. It also occurs on the leaves of celery and carrots in storage. The latter host is also attacked by *Phoma rostrupii* [ibid., iii, p. 506], which is thought to be seed-borne.

Curled parsley roots submitted for inspection showed symptoms resembling those caused on celery by *P. apiicola*. This fungus, however, was not detected on the diseased material, but the oospores of species of *Pythium* or *Phytophthora* were found.

A bacteriosis of lettuce, mainly affecting the curly round varieties, has been observed in Norway of recent years.

A bacterial disease of stored cabbage resembling that described in Holland as 'stippling' [ibid., iv, p. 251] is under investigation.

PRESTON (N. C.). **Part I. Report of the Advisory Mycologist. March, 1927—April, 1928.**—*Rept. Advisory Dept. Harper Adams Agric. Coll., Newport, Salop*, iii, pp. 4–7, 1928.

This report contains the following items of phytopathological interest, in addition to those already noticed from other sources. *Ophiobolus graminis* was reported on wheat from several areas in the west Midlands during the period concerned, and on one farm in Warwickshire considerably damaged the crop. Crown gall of beet [*Bacterium tumefaciens*] is not considered likely to prove important where satisfactory rotation is practised. Corky scab of potatoes [*Spongospora subterranea*] was prevalent in several districts and in one place was very severe. Seed disinfection with fine copper carbonate dust gave almost complete control of bunt of wheat [*Tilletia tritici*], as did steeping in formalin and copper sulphate solutions.

HANSFORD (C. G.). **Annual Report of the Government Mycologist for period October 11th, 1926, to December 31st, 1927.**—*Ann. Rept. Uganda Dept. of Agric. for the year ended 31st December, 1927*, pp. 37–42, 1928.

The root disease of coffee caused by *Rhizoctonia bataticola* [*Macrophomina phaseoli*: *R.A.M.*, vii, pp. 603, 604] is stated to occur sporadically in all the coffee-growing districts in Uganda. The normal progress of the disease is comparatively slow. The fungus first destroys the minute feeding rootlets near soil level and gradually works back along the larger roots towards the collar of

the tree. The tissues of the inner bark are then attacked, and only at a relatively late stage of the disease are the sclerotia of the fungus found in the wood tissues. The infected trees show a generally unhealthy appearance, with considerable dying back of the laterals and gradual shedding of the foliage. In the Sese Islands, however, some of the diseased Robusta trees die very suddenly, with the leaves and berries still hanging on the branches. In the majority of such sudden deaths *M. phaseoli* has been followed by other fungi, including *Armillaria mellea* and *Fomes lamaoensis*, neither of which has been observed on coffee in Uganda in the absence of *Rhizoctonia. M. phaseoli* is also thought to have been the original invader in all the cases examined of 'mealy bug root disease' of coffee, formerly attributed to the combined attacks of *Pseudococcus citri* and *Polyporus coffeae* [ibid., vi, p. 714]. The fact that *M. phaseoli* alone was present in over 75 per cent. of all cases of coffee root disease seen is considered to support Small's view regarding the strongly parasitic nature of this organism [ibid., vi, p. 629].

M. phaseoli has further been discovered on *Hevea* rubber roots at Kampala [cf. ibid., vii, p. 224], in one case accompanied by *A. mellea.* The affected trees looked unhealthy and showed some die-back in the crown. The fungus was found only on the roots occupying the upper 10 to 12 inches of soil. As in the case of coffee, entrance is effected through the delicate rootlets, bunches of which develop, like the fingers of a hand, at the ends of the smaller roots.

Oidium heveae is widespread and causes some damage on young rubber leaves in wet weather.

Cotton seedlings at Kampala were severely injured by sore shin (*Rhizoctonia* [*Corticium*] *solani*) during the dry weather in the early part of the season [ibid., vii, p. 511]. With the advent of cooler and moister conditions the incidence of infection was much reduced.

Some wilted cotton plants showed the presence of *Fusarium* in the wood vessels of the roots and stem bases, whereas in others no trace of fungus could be found. It is, therefore, considered doubtful whether the *Fusarium* plays any part in the causation of the disease, which may be of purely physiological origin.

In Uganda the infection of cotton by *Bacterium malvacearum* is almost entirely restricted to the leaves, the more serious 'black arm' form of the disease on the lateral branches being very uncommon. In a sample of seed submitted for examination, 10 to 12 per cent. of infection by *Bact. malvacearum* was observed in the cotyledons emerging from the soil.

The most important cotton disease at present occurring in Uganda is internal boll rot, associated with *Nematospora gossypii* [ibid., vii, p. 559], *Alternaria longipedicellata* [*A. macrospora*: ibid., vii, p. 444], and a number of other organisms [which are listed]. *N. gossypii* is transmitted with remarkable efficiency (practically 100 per cent.) by stainers (*Dysdercus* spp.). When the bolls are inoculated by means of a fine needle penetrating into the lint cavity only about 40 per cent. of infection is obtained. This suggests that the insects do not merely assist the entrance of the fungus through mechanical injuries, but that they act similarly to a hypodermic

syringe by actually introducing the organism into the interior of the bolls. It has, however, been impossible to detect any stage of the fungus either on the mouth parts or in the internal organs of the insects involved in the transmission of the disease. *N. gossypii* has also been found inside ripe cotton seeds, as well as in those of the avocado, which were affected by a dark, dry, internal rotting.

The only serious disease of sugar-cane hitherto observed in Uganda is mosaic, which has been found in one estate only, where it apparently began to spread early in 1926. An obscure form of top rot [ibid., vii, p. 200] was investigated during the year. The heart leaves of four- to six-months-old canes of the softer yellow varieties turn brown and dry up, while the older ones remain healthy. The young apical stem is rotten for a distance of six to ten inches from the top and emits a very disagreeable odour; the tissues are full of bacteria and fungi, which appear to be entirely saprophytic.

Two diseases affect the newly established tobacco crop in Uganda, viz., mosaic and black shank (*Phytophthora nicotianae*) [ibid., vii, p. 544]. The latter produces very serious effects, the fungus entering the stem base either through the roots or through leaf scars and killing the whole plant. This disease spreads with great rapidity under the damp conditions normally prevailing in Uganda.

Groundnuts suffer from two distinct wilt diseases, one caused by *Sclerotium rolfsii* and the other associated with a *Fusarium* of the *Elegans* section, probably that formerly described in Uganda as *F. udum* [*F. vasinfectum*: cf. ibid., v, p. 18; vi, p. 715].

A banana disease, characterized by a light brown rotting of the rhizomes and the eventual collapse of the plants, has been found in Bugishu and the islands of Lake Victoria. The small cavities in the tissues are filled with a fine white mycelium with clamp-connexions, probably belonging to *Marasmius semiustus*, the cause of a similar disease in Jamaica [ibid., iv, p. 23], or a closely related organism. *Thielaviopsis paradoxa* was reported, for the first time in Uganda, as the cause of a rot of damaged banana fruit.

THOMPSON (A.). **Division of Mycology. Annual Report for 1927.** —*Malayan Agric. Journ.*, xvi, 4, pp. 161–168, 1928.

This report contains the following items of phytopathological interest, other than those already noticed from different sources [*R.A.M.*, vii, pp. 539, 541, 588, 652].

Forty coco-nut palms were inoculated just above the bud with different strains of *Phytophthora* isolated from coco-nut, cotton, rubber, and cacao, but only one positive result was obtained, with *P. palmivora* from coco-nut in India; the fungus was recovered from the margin of the diseased tissue.

Areca palms [*Areca catechu*] are sometimes attacked by a disease which seems to arise in the roots; the leaves shrink and drop, causing the crown to fall over. The stem tissues are soft and spongy, and large hollows occur full of mycelial wefts. Most of the roots, of which the outer ones are attacked first, show a

powdery rot; *Polyporus ostreiformis* was obtained from sections of the stem.

Other records noted include *Fusarium* sp., causing a brown discoloration and a smell like that of strawberries in the central tissues of the radicles of mangrove (*Rhizophora* sp.); *Fomes setulosus* Lloyd, causing a serious chocolate-brown rot of chengal (*Balanocarpus heimii*); leaf disease of *Piper betle* due to bacteria and *Colletotrichum* sp.; leaf spot of Sudan grass [*Andropogon sorghum* var. *sudanensis*] due to *Hendersonia* sp.; *Pestalozzia* sp., causing a leaf spot of mangosteen [*Garcinia mangostana*]; a bacterial bud rot of pineapple; *Vermicularia capsici* on brinjal fruit (*Solanum melongena*); and leaf spots of royal palm (*Oreodoxa* [*Roystonea*] *regia*) due to *Helminthosporium* sp., and of cloves [*Eugenia caryophyllata*] due to *Pestalozzia* sp.

Plant pathology and physiology.—*Fortieth Ann. Rept. Texas Agric. Exper. Stat., 1927*, pp. 59–63, 1927. [Received August, 1928.]

In this report it is stated that infection with the causal organism of cotton root rot [*Phymatotrichum omnivorum*: *R.A.M.*, vi, p. 467] occurred more readily with infected roots of freshly wilted plants than from spores or cultures of the fungus. Temperature did not appear to influence infection. In tests of spore germination over a temperature range of 0° to 150° F. the best results were obtained at 110° to 130°, though only a small percentage germinated; some germination was also obtained by treating the spores with a weak soap solution. Artificial inoculation experiments indicated that no variety of cotton is resistant to this disease.

Experiments with 26 different compounds added to sulphur to minimize or prevent the sulphur burning of cantaloupe leaves treated against mildew [*Erysiphe cichoracearum*] gave negative results. Sulphur dust was effective in controlling rose mildew [*Sphaerotheca pannosa*] except in wet periods, the dust being easily washed off. Sodium thiosulphate at a strength of 0·5 to 1 per cent. was ineffective and stronger solutions caused serious burning of the leaves.

Sclerotium rolfsii continued to grow in soil the P_H value of which was brought to 2·4 by the addition of sulphur, while in pure cultures the fungus grew at P_H 1·25. Other fungi causing damping-off were found to thrive in soil originally at P_H 5·8 to 7·7, to which sulphur at the rate of 30,000 lb. per acre had been applied. *Pythium* grew at a P_H range of 2 to 5·8, *Rhizoctonia* at 2·9 to 7·4, and *Fusarium* at 5 to 7·7.

LIESKE (R.). **Das Krebsproblem vom Standpunkte der Pflanzenphysiologie und allgemeinen Bakteriologie. Vorläufige Mitteilung.** [The cancer problem from the standpoint of plant physiology and general bacteriology. Preliminary note.]—*Centralbl. für Bakt.*, Ab. 2, lxxiv, 15–23, pp. 395–397, 1 pl., 1928.

The views of various investigators who have attributed cancer to (1) a filterable virus [*R.A.M.*, vii, pp. 686, 687]; (2) *Bacterium*

tumefaciens or a closely related organism [ibid., iv, p. 337 *et passim*]; (3) certain Gram-positive bacteria isolated from tumours; and (4) a *Streptococcus* found regularly by Nuzum in every cancer tumour examined, are all believed by the author, as a result of his extensive investigational and experimental work, to be correct. The four apparently distinct organisms are really only stages in the life-history of a single bacillus, which are readily reproduced under suitable conditions. In one of its forms this organism has been named *Bact. tumefaciens.*

There is thought to be no doubt that cancer is a typical infectious disease produced, like typhus or diphtheria, only by one specific agent. Individual strains of the causal organism show certain variations within definite limits, but there is considered to be no ground for the assumption that distinct species are implicated. The most striking stages of the cancer organism hitherto observed are filterable gonidia, unipolar flagellate, Gram-negative bacilli of the *Bact. tumefaciens* type, and Gram-positive bacilli which usually form streptococcal chains when freshly isolated from human or animal tumours. The acidity requirement increases with the duration of culture. The stimuli used in the experimental production of cancer are not the cause of the disease, but merely facilitate infection by the cancer bacilli. The cancer organism is believed to be ubiquitous in nature, occurring in its various stages on and in the human and animal system. Possibly the explanation of its transformation from the saprophytic to the parasitic stage should be sought in the botanical and morphological sphere, rather than in that of physiology. In human, animal, and plant tumours the cancer bacillus normally occurs in an ultra-microscopic form, apparently in the most intimate symbiosis with the host cells.

LIESKE (R.). **Untersuchungen über die Krebskrankheit bei Pflanzen, Tieren und Menschen.** [Investigation of plant, animal, and human cancer.]—*Centralbl. für Bakt.*, Ab. 1 (Orig.), cviii, 1–4, pp. 118–146, 3 pl., 1928.

This is an extended account of the author's comparative investigations on plant, animal, and human cancer, a preliminary notice of which has already appeared [see preceding abstract]. The main line of argument as to the typically infectious nature of the disease is further developed, and various aspects of the activities of the causal organism are discussed. In order to express the idea of polymorphism, the substitution of the name *Polymonas tumefaciens* for *Bacterium tumefaciens* is proposed.

SMITH (E. F.). **Tumours, cysts, pith-bundles, and floral proliferations in Helianthus.**—*Mem. Nat. Acad. of Sci., Washington*, xxii, 4, 5 pp., 43 pl., 1927.

The author described needle-prick inoculations which he carried out in 1925 on the young floral heads of the sunflower, *Helianthus annuus*, with the crown gall organism *Bacterium tumefaciens.* Thirty per cent. of the inoculated plants produced a proliferation of small stalked or sessile, perfect or imperfect, supernumerary floral heads from the middle of the floral disk. These bore sterile ray flowers and large green bracts which showed up very prominently

in the midst of the normal tubular, fertile disk florets. Many of the heads also bore crown galls, while the part of the stalk immediately below the head also bore tumours and showed one or more cyst-like cavities in the pith in a large proportion of the inoculated plants. With the elongation of the stem, these cysts attained a length of one to two feet, but they did not extend below the part which bore crown gall tumours. They were lined with a well-defined, small-celled tissue, and this in turn was bounded by a continuous or much broken ring of vascular bundles in which the phloem was on the inside and the xylem outside. These inverse bundles sometimes furnished a continuous woody cylinder or stele. When they remained discrete the xylem sometimes completely surrounded the phloem or vice versa. The innermost layer of the tissue bounding the cavity sometimes bore on its free surface glandular or acicular trichomes similar to those found on the torus. In a few inoculations made in 1924 the new central stele was solid and in at least some cases appeared to have developed from the protoxylem. In the cavities themselves or the outer tissues, especially the cambium, crown galls developed which expanded and distorted the cavities and also appeared on the surface of the stem.

Similar cavities lined with a trichome-bearing epidermis and bounded by a more or less continuous ring of inverse vascular bundles developed in the pith of 40 out of 108 sunflowers pricked with a sterile needle in the young flower heads in the autumn, but floral proliferations were less frequent and smaller than on the inoculated plants, no doubt because of the retarded growth of the autumn plants. In July, 1926, another lot of young plants was similarly pricked, except that in some a blunt needle was used, and all of these developed cavities bounded by inverse bundles and extending downwards from the receptacle sometimes for as much as five feet. Where several pricks were made in a single young flower head as many cavities might develop in the elongating part of the stem.

The author regarded the inverse orientation of the tissues bounding all these cavities as due to transplantation of fragments of the torus carried in on the needle and uniting in an invaginated position with the surrounding pith cells, the grafted tissue then developing with the elongation of the stem. Similar parasitic or mechanical displacements occurring in early life are held to account for many common teratological phenomena in animals and plants.

Esdorn (Ilse). **Die Feststellung der Wirkung von Trockenbeizmitteln im Laboratoriumsversuch.** [The determination of the action of disinfectant dusts in laboratory experiments.]—*Angew. Bot.*, x, 2, pp. 178–186, 1928.

Using a method based essentially on a combination of those of Pichler, Winkelmann, and Rabien [*R.A.M.*, vi, p. 281; vii, p. 83], the writer tested a number of disinfectant dusts for the control of wheat bunt [*Tilletia tritici* and *T. levis*]. In order to determine the lowest concentration at which each preparation is effective, the dusts were diluted by the admixture of kaolin or soil down to $\frac{1}{128}$

of their original strength. The experiments were carried out at a temperature of 5° to 10° C.

The results of the tests (details of which are reserved for further publication) indicate that the new mercurial dusts inhibit the germination, not only of the spores with which they are in direct contact, but also of those at a distance of several millimetres. On the other hand, immediate contact is essential to secure the destruction of the spores by copper compounds and porzol in its original form. There can be no doubt that the greater efficacy of the mercurial preparations is correlated with their wider field of toxicity.

The different preparations were also found to vary in their capacity to inhibit spore germination by immediate contact, some being effective at dilutions down to $\frac{1}{100}$ of their original strength, while others fail at $\frac{1}{2}$ to $\frac{1}{10}$. The disinfectants which proved most valuable under practical field conditions were those exhibiting a strong fungicidal action both on the spores in immediate contact and also on those at a distance.

WINKELMANN (A.). **Zu dem Vortrag von I. Esdorn 'Die Feststellung der Wirkung von Trockenbeizmitteln im Laboratorium', Heft 2 dieser Zeitschrift, 1928, S. 178.** [Note on the lecture of I. Esdorn, 'The determination of the action of disinfectant dusts in the laboratory', Part 2 of this periodical, 1928, p. 178.]—*Angew. Bot.*, x, 3, pp. 305–307, 1928.

In connexion with Miss Esdorn's laboratory tests of a number of disinfectant dusts for the control of cereal diseases [see preceding abstract], the writer briefly recapitulates his method for the determination of the relative merits of these preparations [*R.A.M.*, vi, p. 281].

NIETHAMMER (ANNELIESE). **Bemerkungen zur Ermittlung der Dosis toxica bei den Steinbrandbeizmitteln.** [Observations on the determination of the *dosis toxica* in bunt disinfectants.] —*Fortschr. der Landw.*, iii, 12, pp. 551–552, 4 graphs, 1928.

Attention has been drawn by Friedrichs and Gassner [*R.A.M.*, v, p. 410] to the fluctuations in the *dosis toxica* of different disinfectants against wheat bunt [*Tilletia tritici* and *T. levis*] according to the varieties of wheat used in the trials and other circumstances. The writer recently conducted a series of tests with two liquid preparations, germisan and uspulun, and two dusts, abavit B and tutan, using six varieties of Bohemian and Moravian wheat. The seed-grain was immersed for an hour in the liquid preparations at a temperature of 15° C., or shaken up for 15 minutes in a glass with the dusts, after which it was placed on damp filter paper in Petri dishes at 4° to 6° for germination. The *dosis toxica* [i. e., the first indication of a deleterious effect on the seed] was found to vary between comparatively wide limits in the liquid preparations, especially germisan (0·1 to 0·4 per cent.), while there was much less difference in the action of the dusts, abavit B being particularly uniform (0·3 to 0·4 per cent.).

STIRRUP (H. H.) & CRANFIELD (H. T.). **Attempts to control bunt (Tilletia tritici Wint.) in Wheat with a formalin-gypsum dust.**—*Ann. of Appl. Biol.*, xv, 2, pp. 245–250, 1928.

Some details are given of a series of experiments over a period of four years in which wheat seed heavily infected with spores of *Tilletia tritici* was treated with a dry powder composed of formaldehyde and calcined gypsum [the preparation of which is described]. The results were inconclusive since in the first two years, when clean seed was artificially infected with bunt spores, the control was good, while in the last two years, when the seed used was naturally and also artificially infected by bunt, the dust gave little or no control. This discrepancy in the results is considered to provide some evidence to support the view that *T. tritici* is a fungus comprising a number of biologic forms, as the spores used in the first two years were obtained from crops of different varieties of wheat, while in the last two they came from the crop that supplied the seed.

KOURSSANOW (A. L.). **De l'influence de l'Ustilago tritici sur les fonctions physiologiques du Froment.** [On the influence of *Ustilago tritici* on the physiological functions of Wheat.]—*Rev. Gén. de Botanique*, xl, 473, pp. 277–302, 3 graphs; 474, pp. 343–371, 1928.

The first part of this paper is a full translation of an article already noticed from the Russian [*R.A.M.*, vii, p. 154]; in the second part a detailed account is given of the author's further researches, conducted at Moscow with a pure line of *Triticum vulgare* var. *lutescens*, into the effects of loose smut (*Ustilago tritici*) upon the physiological functions of the host. Briefly summarized, the results [which are tabulated and fully discussed] are as follows.

The assimilation of carbon dioxide by the leaf blades (measured by the amount of gas absorbed by 1 sq. cm. of the leaf blade surface in 1 hour) was nearly always more active by from 4 to 30 per cent. in smutted than in normal wheat, while the leaf sheaths and stems of affected plants also generally showed a more active assimilation. No difference was detected between the chlorophyll content of healthy and diseased leaves.

Smutted plants transpired 20 to 23 per cent. more water than did normal plants. The more active transpiration is considered to be due, very probably, to such factors as weakness of the cuticular layer and the increased number or size of the stomata.

It was found that the total amount of reserve carbohydrates was approximately the same in healthy and smutted plants, or a little greater in the latter, but that the content of soluble sugars was always higher in smutted plants, the increase affecting both glucose and cane sugar. It is considered probable that this increase is brought about at the expense of the starch, the amount of which is proportionately less in smutted plants. This may be due either to the more energetic action of the ferments in the smutted plant or to the saccharifying action of the fungus. Towards the time when the ear opens, the movement of the carbohydrates from the

leaves into the axial parts of smutted plants during the night was much retarded.

The total nitrogen and the albuminoid nitrogen were approximately the same in normal and smutted plants.

The growth of diseased plants was more active than normal during the first 20 to 25 days of vegetation, after which their development gradually became retarded, so that at flowering time their dry weight was only 60 to 64 per cent. of that of normal plants.

BENNETT (F. T.). **On Cladosporium herbarum: the question of its parasitism, and its relation to 'thinning out' and 'deaf ears' in Wheat.**—*Ann. of Appl. Biol.*, xv, 2, pp. 191–212, 2 pl., 2 figs., 1928.

A detailed description is given of the investigation carried out by the author in the north of England of the morphological and biological characters of *Cladosporium herbarum* [*R.A.M.*, vii, p. 88] and of its relationship to the trouble locally known as 'thinning out' or 'deaf ears' in wheat. A careful examination of material collected from different kinds of plants, but most frequently from wheat, barley, oats, and rye, showed that while the different forms of *Cladosporium* consistently differed from each other in macroscopical characters in pure monosporous culture, such differences were revealed only when subcultures were simultaneously grown on several media, the full range of the differences not being given on any one medium. Under the microscope, however, the types could not be distinguished from one another, as all showed similar variations in shape, size, and colour of the conidia. It is therefore considered, in agreement with Brooks and Hansford [ibid., iii, p. 52], that these types are strains of *C. herbarum*, and not different species. It was also found that a given type occurred on one kind of host more frequently than on other hosts, although no one form was confined to any one host. So far, three distinct strains have been found to occur commonly on the cereals, and two others on species of *Brassica*, and the author suggests calling them tentatively 'prevalent strains'.

All the five prevalent strains of *C. herbarum* profusely produced the *Hormodendron* stage on very moist media; this stage also always appeared when material naturally bearing *C. herbarum* was incubated in moist chambers. All attempts to produce this form free from the *Cladosporium* type of spore by culture on artificial media or from leaves in the field gave negative results.

Inoculation experiments showed that none of the five abovementioned strains of *C. herbarum*, which are regarded as typical of the species, is parasitic in any stage or form on healthy plants among the cereals and species of *Brassica* tested. The budspore forms, or so-called *Hormodendron* stages, of these strains, did not differ in parasitic capacity from the normal *Cladosporium* forms, and were shown to be incapable of causing perforation of living leaves of species of *Brassica*. The fungus may, however, attack plants that are unhealthy from some other cause, becoming established on the dying tissues and hastening their final collapse.

Bennett (F. T.). **On two species of Fusarium, F. culmorum (W. G. Sm.) Sacc. and F. avenaceum (Fries.) Sacc., as parasites of cereals.**—*Ann. of Appl. Biol.*, xv, 2, pp. 213–244, 2 pl., 2 figs., 1928.

The investigation described in detail in this paper gave definite proof that *Fusarium culmorum* (= *F. rubiginosum* App. and Wr. and *F. versicolor* Sacc.) and *F. avenaceum* (= *F. roseum* Lk. var. *lupini albi* Sacc. and *F. subulatum* App. and Wr.) are to a great extent responsible for the diseased condition of wheat known under the names 'thinning out' and 'deaf ears' in the north of England, where it is very prevalent and sometimes causes losses amounting to from 50 to 75 per cent. of the crop.

Inoculation experiments [full details of which are given] showed that both species are capable of attacking healthy seedlings of wheat, oats, barley, and rye. *F. avenaceum* appeared to do less damage to the plants in the early stages of their development, except in moist soil, but eventually the effects on the established plants were similar for both species. Some loss was caused by the failure of some of the infected seed to germinate, but the main damage was done by the subsequent dying-off of the seedlings ('seedling blight'), wheat and rye suffering more severely than barley or oats. At a later stage, the seedlings of all the four cereals showed similar symptoms. They were invaded at and below soil level, the crown and many of the roots becoming soft and brown. In persistently moist soil the rotting of the underground parts was more pronounced, and the fungus sometimes extended within the tissues an inch or more above soil level and then emerged to the surface; very few of the seedlings survived when so affected. Diseased plants that survived the earlier attacks made poor growth, were of a sickly yellowish-green colour, and their leaves (even the youngest) withered from the tips downwards, the extent of the withering depending on the severity of the basal infection. This condition of the wheat seedling is frequently observed in the spring in the fields and is locally known as 'spring yellows'. At earing time, the ear-bearing stems of diseased plants may show partially or fully protruded ears, but instead of progressing to maturity, the stems and ears become bleached or 'prematurely ripe', and the ears are either devoid of grains or contain only a few small, shrivelled ones, a condition locally known as 'whiteheads' and 'deaf ears'.

Further experiments and field observations also showed that both species, more especially *F. culmorum*, cause a blight of the ears by external infection with wind-borne conidia, resulting in sterility of the florets or in diseased grain. Infected grains may fail to germinate, but those which showed a discoloration limited to the side or apex gave rise to seedlings which were often severely attacked by the fungus. Therefore seed-grain from a crop attacked in the ears by either species may not only show a germination capacity reduced by one-third or one-half, but the germination figure obtained will not represent the probable stand because of the subsequent death of many seedlings.

Both pathogens overwinter in diseased material in the granary or in the field. Under storage conditions they retain their vitality

for considerably more than a year, and there is evidence that they may persist for several years in contaminated soil. Control measures should consist in improving the physical condition of the soil, adequate drainage directed especially towards the prevention of superfluous or stagnant water near soil level, fallowing, and crop rotation, the latter being considered as probably the most convenient and effective method.

The cultural and diagnostic characters of both species are given in detail.

MASCHMEIER (W.). **Eine neue Trockenbeize zur Bekämpfung des Haferflugbrandes.** [A new dust for the control of loose smut of Oats.]—*Nachricht. über Schädlingsbekämpf.*, iii, 1, pp. 1–4, 1928.

A new preparation, known as hafertillantin and supplied by the I. G. Farbenindustrie Aktiengesellschaft, Leverkusen, has been found to give excellent control of loose smut of oats [*Ustilago avenae*] without any reduction of germination. The dust is applied at the rate of 300 to 350 gm. per 100 kg. of seed-grain.

BUNTING (R. H.). **Fungi affecting Graminaceous plants of the Gold Coast.**—*Gold Coast Dept. of Agric. Bull.* 10, 51 + iii pp., 11 pl. (2 col.), 1928.

This bulletin is intended as a preliminary survey of the fungi causing diseases among the Graminaceous crops of the Gold Coast and its dependencies. It also contains notes on the occurrence of certain saprophytic organisms, and of some fungi affecting related hosts.

The maize diseases described include smut (*Ustilago zeae*); black bundle (*Cephalosporium acremonium*) [*R.A.M.*, vii, p. 231]; brown spot (*Physoderma zeae-maydis*) [ibid., v, p. 657] which was found to affect 54 per cent. of the stand in a field of young maize; leaf blight (*Helminthosporium turcicum*); a leaf spot caused by the conidial stage of *Ophiobolus heterostrophus* [*H. maydis*: ibid., vi, p. 157]; another leaf spot associated with *Acrothecium lunatum* [ibid., vii, p. 231]; a leaf blotch due to *Diplodia macrospora* [loc. cit.] and characterized by the production of straw- to cinnamon-coloured, dark-edged lesions; an affection of the foliage caused by a species of *Marasmius* closely allied to *M. scandens*, which forms irregular, zonate, dark brown lesions with buff-coloured or dark brown margins over large areas of the lamina; a condition known as mouldy tassels, in which the spikelets of the male inflorescences are matted together by a velvety, greenish-black mould, probably *H. maydis*; ear rots associated with a number of organisms (not yet fully investigated) including *D. macrospora* and *Gibberella moniliformis*; and black grain (*Botryodiplodia theobromae*) [loc. cit.]. The following are amongst the saprophytic or doubtfully parasitic forms: *Phoma zeicola*, *Clasterosporium maydicum* [ibid., vi, p. 144], *Nigrospora sphaerica* [ibid., vi, p. 757], *Papularia sphaerosperma*, and *Epicoccum neglectum*.

The sorghum crop is liable to severe damage by smut (*Sphacelotheca sorghi*): other common diseases of this host are rust (*Puccinia purpurea* [ibid., vii, p. 399], leaf spots (*Colletotrichum andro-

pogonis and *Cercospora sorghi*), and mouldy inflorescences associated with *A. lunatum*.

Bulrush millet (*Pennisetum typhoideum*) is subject to infection by smut (*Tolyposporium penicillariae*), sugary disease (*Sphacelia* sp.) [ibid., vi, p. 398], green ear (*Sclerospora graminicola*), rust (*Puccinia penniseti*), and leaf spot (*Helminthosporium* sp.).

The most serious disease of rice (which is grown only to a very limited extent in the Gold Coast) is blast (*Piricularia oryzae*) [ibid., vii, p. 266]. *H. oryzae* [ibid., vii, pp. 54, 55 *et passim*] causes a brown leaf spot, and (together with *A. lunatum*) is also associated with the development of mouldy inflorescences. *N. oryzae* [ibid., vi, p. 758] is also of frequent occurrence.

The few small sugar-cane plantings in the Gold Coast are mildly attacked by ring spot (*Leptosphaeria sacchari*). Other fungi on this host are *A. lunatum*, *N. sphaerica*, and an undetermined species of *Helminthosporium* with fuliginous, straight or slightly curved, sub-cylindrical, 7- to 11-septate spores, measuring 38 to 148 by 13 to 16 μ.

Among the records of interest on wild hosts may be mentioned a species of *Sphacelia* (distinct from that reported above and possibly related to the genus *Langloisula*) on *Andropogon gayanus* var. *bisquamulatus*; *U. heterospora* and *Phyllachora* (? *heterospora*) on *Panicum maximum*; *Cerebella cenchroidis* on *Pennisetum polystachum*; a rust (possibly *Puccinia rottboeliae*) and *Helminthosporium* sp. (with spores measuring 43 to 58 by 13 to 15 μ) on *Rottboelia exaltata*.

MELHUS (I. E.), VAN HALTERN (F. H.), & BLISS (D. E.). **A study of Sclerospora graminicola (Sacc.) Schroet. on Setaria viridis (L.) Beauv. and Zea mays L.**—*Iowa Agric. Exper. Stat. Res. Bull.* 111, pp. 297–338, 8 figs., 1928.

This is an expanded account of the authors' studies on the infection of maize and *Setaria viridis* by *Sclerospora graminicola*, a preliminary notice of which has already appeared [*R.A.M.*, vi, p. 415].

A table is given showing the distribution and morphological characters of the 10 described species of *Sclerospora*, seven of which have been recorded on maize.

The process of conidial [sporangial] development in *S. macrospora* was found to occupy between 4 hours 35 minutes and 11½ hours. Essential conditions for the production of sporangia, which may occur during both day and night [cf. ibid., iii, p. 718], are complete saturation of the atmosphere, turgid host leaves covered by a slight film of moisture, and a temperature between 8° and 27° C. The sporangia are forcibly discharged to a maximum distance of 2·5 mm., and were found to liberate zoospores after one hour in water, the best germination being obtained at 15°. The average dimensions of the sporangia were found to be 14 to 23 by 11 to 17 μ, but some larger individuals (43 by 18·6 μ) were also produced. The conidiophores measure 214·5 to 375·3 μ (average 267·8 μ). *S. viridis*, millet (*S. italica*), May's Golden maize, and *Euchlaena mexicana* proved susceptible to infection by the zoospores. The first-named was found to be more susceptible than

any of the other hosts of the fungus, which comprise five genera of Gramineae, including sorghum and *Saccharum* in addition to those already mentioned. Popcorn was more readily infected than the Dent and sweet varieties of maize.

The oospores of *S. graminicola* overwinter naturally in field soil under Iowa conditions and infect the host in the spring. In one test, oospores which had overwintered outdoors gave nearly twice as much infection on Japanese Hull-less maize (popcorn) as did those kept in the laboratory.

The usual incubation period between placing the oospores on the seeds and the development of sporangia on the leaves was found to be six days. Infection from oospores occurred from the time of the rupture of the testa until the emergence of the plumule above ground. Temperatures of 15° to 16° were observed to be more favourable to infection than 24° to 30°.

Freshly collected oospores kept dry for one hour at 77° C. later gave 52 per cent. infection on *S. viridis*, while wet spores lost their viability to a great extent when kept at 50° for the same time.

S. graminicola was studied in the field during the summers of 1925 to 1927 inclusive. Spontaneous development of the sporangial stage was rarely observed on maize, except on young seedlings during periods of high humidity and low temperatures. Infected plants were generally stunted and unproductive or killed outright, though a few seemed to outgrow the attack.

The oospores of *S. graminicola* were shown to retain their viability for 2½ years under dry laboratory conditions. The percentage of infection is apparently not affected by the presoaking of the oospores. Soil is not essential as a medium for their germination.

HOLBERT (J. R.), REDDY (C. S.), & KOEHLER (B.). **Chemical-dust seed treatments for Dent Corn.**—*U.S. Dept. of Agric. Circ.* 34, 5 pp., 1928.

Three chemical dusts, viz., Bayer (4 per cent. hydroxymercurinitrophenol sulphate), improved semesan jr. (12 per cent. hydroximercuricresol), and merko (supplied by the Corona Chemical Division, Pittsburgh Plate Glass Co., Milwaukee, and containing the equivalent of not less than 3·5 per cent. metallic mercury), gave good control of *Diplodia* [*zeae*], *Gibberella* [*saubinetii*] and *Basisporium* [*gallarum*: *Nigrospora sphaerica*: *R.A.M.*, vii, p. 505] on Dent maize in a series of tests conducted at various localities in Iowa and Illinois during 1926–7. The average increases of yield obtained in Illinois were as follows: good tested seed, an increased yield of 0·8 bushels per acre by Bayer and 1·9 by improved semesan jr.; good untested seed, 2·1 and 5·4 bushels, respectively; diseased tested seed, 9 and 12 bushels respectively. At Ames, Iowa, the yield of diseased tested seed was increased by 5 and 5·8 bushels per acre by Bayer and merko, respectively.

BAHGAT (M.). **The action of Phomopsis californica in producing a stem-end decay of Citrus fruits.**—*Hilgardia*, iii, 6, pp. 153–181, 4 figs., 2 diags., 1928.

The results are described of a study of the parasitism of

Phomopsis californica, especially in relation to its action on the different tissues of citrus fruits [*R.A.M.*, v, p. 20].

Of the various species of citrus inoculated. lemons proved to be the most susceptible, the stem-end being the principal site of infection under laboratory conditions as well as in nature. The elements most commonly attacked were the albedo, the core, and the vascular bundles, while the oil- and juice-bearing tissues were almost free from invasion.

A comparative examination of the healthy and infected tissues [details of which are given] showed that the water soaked belt ahead of the discoloration on the diseased fruit was always free from mycelium, suggesting that some soluble substance produced by the fungus diffuses through the tissues and kills the cells for some distance in advance. The pathological changes in the progressive zone of infection are mainly plasmolysis and maceration. Healthy tissues exposed to the action of mycelial extract and liquid in which the fungus was grown showed the typical symptoms of the disease. The fact that the mycelium, which is abundant at the margin of discoloration in the affected rind, becomes completely disorganized in the older diseased tissues, suggests that the enzymes and their by-products are able to dissolve the older hyphae.

Besides the stem-end, infection can also take place through wounds. The uninjured rind appears to act as a barrier, possibly owing to the presence of oil (which entirely inhibits the growth of the fungus) in the outer layers. Penetration of the fruit occurs chiefly through the exposed vascular strands of the albedo and core, both of which are devoid of oil glands.

In the pulp the main protection against mycelial invasion is attributed to the high acidity of the juice (average P_H value 2·31), the minimum hydrogen-ion concentration for the growth of *P. californica* being P_H 3·2, while development occurred chiefly between 4·7 and 5·2.

The fungus was found to produce cytase, pectinase, invertase, maltase, emulsin, proteases, amidase, and lipase. Its ability to grow on a solid medium containing cellulose as the only source of carbon and also on pure filter paper is regarded as indirect evidence of the secretion of cytase.

CUNNINGHAM (H. S.). **Histology of the lesions produced by Sphaceloma fawcettii Jenkins on leaves of Citrus.**—*Phytopath.*, xviii, 6, pp. 539–545, 2 figs., 1928.

The investigations reported in this paper were undertaken to determine the nature of the histological changes occurring in rough lemon (*Citrus limonia*) leaves infected by scab (*Sphaceloma fawcettii*) [*Sporotrichum citri*: *R.A.M.*, vii, p. 316]. Similar changes were found in sour orange (*C. aurantium*) and Rangpur lime (*C. aurantifolia*).

Transverse sections through lesions on the under surface of the leaves show a marked thickening of the affected area, with a protrusion on the lower surface and a corresponding depression on the upper one. The number of cells is greatly augmented and a striking change is noticeable in the character of the cells in the involved tissues.

The upper epidermal cells show no alteration except for the occurrence of anticlinal division. The walls of the palisade cells are thickened and the chloroplasts are reduced in number and size, or have disappeared completely. Anticlinal division may be observed here also, and in some cases periclinal division as well.

The number and size of the cells in the spongy parenchyma, where the bulk of the swelling occurs, are conspicuously increased, apparently as a result of division in several planes followed by hypertrophy : intercellular spaces are almost entirely absent. The cell walls are greatly thickened but show no trace of lignification, and there is a peripheral layer of cytoplasm with a clearly discernible nucleus. In the early stages of the lesion a phellogen is formed in the spongy parenchyma within the lower epidermis, and a definite phellem is established, isolating the portion invaded by the fungus. The cells outside this phellem are dead and have suberized walls. The hyphae of the causal organism are numerous in the outer portion of this mass of suberized cells, but no trace of them was perceptible in the tissues enclosed by the phellem.

When infection occurs on the upper leaf surface the histological changes do not differ essentially from those already described. The phellogen is also formed in the spongy parenchyma and extends on either side to the upper epidermis. Thus it lines a cup-shaped cavity occupied by a mass of dead cells intermingled with hyphae. A distinct bulging occurs on the under side of the leaf in consequence of the hyperplastic condition of the spongy parenchyma.

In some cases the phellem may extend throughout the hyperplastic portion, forming a layer from the upper to the lower surface and surrounding the edge of the lesion with a continuous band. Such a condition would explain the shot hole effect sometimes accompanying this disease.

The changes induced in citrus leaves by a simple perforating wound are also briefly described for purposes of comparison.

BRITON-JONES (H. R.). **Root diseases in the British West Indies and a note on Diaporthe perniciosa Marchal or a closely related species.**—*Trop. Agriculture*, v, 4, pp. 79–82 ; 5, pp. 107–110, 1928.

The general trend of this paper is in support of the view already expressed by the author in former publications [*R.A.M.*, vii, pp. 119, 408] that *Macrophomina phaseoli* is not, as believed by Small [ibid., vii, p. 678], the primary cause of root disease of cultivated plants in the tropics. After reproducing briefly his observations and experiments in Trinidad relating to inoculations of the fungus on cotton and jute, he gives some details of his investigation of a serious epidemic of root disease of West Indian seedling lime trees [*Citrus aurantifolia*] in Dominica, where all the trees examined, with one exception, were found to bear on their roots the typical rhizomorphs of *Sphaerostilbe repens*. The one exception, which was found after prolonged search, was in the primary stage of the disease and exhibited symptoms very similar to those of the red root disease, namely, defoliation and death of one branch of the tree. Another point of similarity with the latter disease was the fact that only one main root of the tree was found diseased, and

that only in its upper half and in the portion near the crown. The wood in the half of the branch corresponding to the diseased area of the root was grey in colour, and yielded, on isolation, *M. phaseoli*. It is pointed out that the tree in question was planted on a mound above the general level of the ground, and the soil below it was exceptionally dry. The author believes that in this case the establishment of the fungus was facilitated by the weakened condition of the tree due to dryness of the soil. In general, his observations lead him to consider that the factors predisposing to root disease of limes in Dominica are poor cultivation (insufficient weeding, careless pruning, too close planting), the excessive use of sulphate of ammonia on many estates, the prevalence in the island of the wither-tip and die-back disease [*Gloeosporium limetticolum*], and injury to the roots caused by insect grubs. In regard to the latter, however, it was noted that although the roots of sour orange were also attacked by the grubs, not a single case of root rot was observed wherever limes or other citrus fruits had been grafted on this stock. Other contributing factors may be the severe floods and hurricanes which are occasionally experienced. The palliative measures recommended are those that are usually practised against 'mal di gomma' (*Pythiacystis* [*Phytophthora*] *citrophthora*).

With regard to Small's opinion [ibid., vi, p. 630] that die-back of the aerial parts of a tree is to be usually regarded as a symptom of other trouble, most probably of attack by *M. phaseoli*, the author states that isolations from the very edge of the diseased tissues of of rubber, camphor, *Gliricidia*, and cacao trees suffering from die-back in the West Indies, have almost invariably yielded a species of *Phomopsis* very similar to, if not identical with, the conidial stage of *Diaporthe perniciosa*, a fungus associated with die-back in fruit and other trees in England [ibid, vii, p. 647], while the critical examination of large numbers of root systems of the diseased trees failed to show the presence of *M. phaseoli*. In his view, however, *D. perniciosa*, like the species of *Diplodia* usually associated with die-back, is only secondary, and follows a check to the trees due to various causes, such as excessive soil moisture, potash deficiency in the soil, or the attacks of *Stereum purpureum* or *Armillaria mellea*.

BRITON-JONES (H. R.). **Wilt diseases of Coconut palms in Trinidad. (Part I).**—*Trop. Agriculture*, v, 5 (Supplement), 12 pp., 3 diags., 1928.

The author distinguishes two forms of the wilt disease of coconut palms recorded by Nowell in Trinidad [*R.A.M.*, iv, p. 415] which he proposes to name respectively 'bronze leaf wilt' and 'yellow leaf or tapering stem wilt'. The latter is a chronic malady and its etiology has not yet been worked out; its symptoms are very similar to those described by Park as caused in Ceylon by a root disease associated with *Macrophomina phaseoli* [ibid., vii, p. 29 and next abstract], and consist in a yellow discoloration of the leaves progressing from the tips backwards, while all the leaves, including the central ones, become dwarfed. It is pointed out that in Trinidad, trees suffering from this disease often become liable

to bronze leaf wilt, which, however, is regarded as a separate disease.

In its external symptoms bronze leaf wilt is almost indistinguishable from red ring disease (due to the nematode *Aphelenchus cocophilus*), and is characterized by the fact that two or more of the lowest and oldest leaves assume first a yellow and later a bronze or reddish-brown colour, coupled with the yellowing at the tips of the next two or three leaves. The main point of difference from red ring disease is that the wilting of the leaves always progresses in order of age, i.e., the lowest leaf is in a more advanced stage of wilting than the next above it, and so on. At a later stage, the yellowing extends upwards to still younger leaves, but long before the youngest leaves show any discoloration the central spear is attacked by a bacterial rot which eventually involves the whole cabbage. A browning of the tips of the spathes of the inflorescence occurs slightly in advance of that of the leaves in whose axils they are borne, and the green nuts are shed prematurely. No internal symptoms have so far been observed which might be considered of diagnostic value.

The examination of trees in different stages of the disease showed that the trouble is caused by underground factors which interfere with the functions of the vascular system of the trees, as suggested by the absolute regularity of the progress of wilting with the age of the leaves. In the early stages of the wilt, when only four to six of the lowest leaves were affected, no signs of bacterial or other disease was ever observed in the tender tissues in the centre of the crown, and isolations from a large number of roots in different stages of decay usually only yielded a species of *Diplodia* which is considered to be a pure saprophyte. In the author's opinion, based on his observations in Trinidad and some of the other West Indian islands, the onset of bronze leaf wilt is, in the majority of cases, due to physiological drought which does not need a prolonged dry period but may become evident after a short dry period under certain soil conditions, especially where the soil is heavy and in bad tilth. This opinion is further supported by the fact that bronze leaf wilt symptoms were experimentally reproduced in healthy trees by digging trenches around them.

Control measures should consist in the amelioration of the tilth of the soil in fields intended to be planted with coco-nut palms, proper drainage, adequate spacing of the trees, and periodical removal of weeds from the plantations. A detailed discussion of these is given.

PARK (M.). **Investigation of root diseases of Coconuts.**—*Trop. Agriculturist*, lxx, 6, pp. 402–407, 1928.

A preliminary investigation of the root disease problem of the coco-nut palm in Ceylon indicates that environmental conditions, particularly those of the soil, play a preponderant part in it. The coco-nut palm appears to be very resistant to the attacks of root fungi, since its capacity of developing main roots in succession from the base of the stem enables it, in the case of serious injury to one or more roots, to form new ones either above the lesions or from the bole. It was found that in normal healthy plants a root fungus may be established for a considerable time before the gradual

reduction in vitality becomes apparent above ground. If, however, the organism from the roots penetrates and kills the tissue of the butt or bole of the palm, more rapid death ensues owing to the stoppage of the supply of water and nutrient substances from the soil.

For convenience, the author considers two forms of disease which he terms 'root disease' and 'butt disease'; it is pointed out, however, that the distinction is arbitrary, since a root disease may also affect the butt or may be the predisposing factor for the development of butt disease. The external symptoms of root disease are those of slow degeneration [cf. preceding abstract], and may be brought about by unfavourable soil conditions, such as drought, flooding, the presence of an inhibiting factor, the absence or insufficiency of a soil constituent essential for normal growth, and by old age, as well as by fungi. It is pointed out that where these conditions prevail, a number of trees is generally found to be affected in a given area, but that where they are less general they may cause a decrease of resistance to disease which may be confined to certain trees only, the disease then appearing sporadically.

With regard to the discovery of *Rhizoctonia bataticola* [*Macrophomina phaseoli*] on the dead roots of coco-nut palms displaying symptoms of tapering in a number of districts in Ceylon [*R.A.M.*, vii, p. 29], the author believes that further investigation will probably reveal its presence everywhere. However, the recent discovery of the fungus in apparently healthy roots of tea [ibid., vii, p. 604] suggests the possibility of its being a common mycorrhizal form, and as an endophyte has also been seen in the small roots of the coco-nut, he tentatively suggests that *M. phaseoli* may normally be a mycorrhizal fungus, and may produce sclerotia when some conditions arise to cause the death of the root. Experiments are now in progress to test the validity of this theory. In addition to *M. phaseoli*, other fungi have been isolated from the roots of coconuts exhibiting symptoms of tapering, and inoculation experiments are in hand to determine their pathogenicity.

The butt form of coco-nut disease is comparatively rare in Ceylon, although cases have been recorded as caused by *Fomes lucidus* [*Ganoderma lucidum*: ibid., vi, p. 274]. It is thought probable, however, that these attacks are induced by certain conditions of the soil, since the fungus is common in coco-nut land whereas the disease caused by it is rare. The removal and burning of tissues infected by *F. lucidus* and other organisms of this type is advocated, since they may spread from tree to tree under certain conditions.

Nobécourt (P.). **Pathologie végétale et pathologie animale.** [Plant and animal pathology.]—*Rev. Gén. des Sciences*, xxxix, 12, pp. 369–373, 1928.

This is a discussion, in general terms, of the relations and analogies between plant and animal pathology, illustrated by various important developments in both fields.

Da Fonseca (O. O. R.). **Ensayo de revisión de las blastomicosis sudamericanas.** [Attempt at a revision of the South Ameri-

can blastomycoses.]—*Bol. Inst. Clin. Quirurg.*, iv, 28–31, pp. 469–501, 19 figs., 1928.

In this paper the writer discusses the clinical aspects and systematic position of *Coccidioides immitis* [*R.A.M.*, vii, p. 167], *Mycoderma dermatidis, Rhinosporidium seeberi* [ibid., iii, p. 153], and *Pseudococcidioides mazzai* n. g., n. sp., associated, respectively, with coccidioid granuloma, Gilchrist's disease or American blastomycosis *sensu stricto*, rhinosporidiosis, and Mazza's and Parodi's mycosis. All these are regarded as allied genera belonging to the Protomycetaceae, Ashworth's reference of *Rhinosporidium* to the Chytridiaceae [loc. cit.] not being accepted.

Notes are given on the prevalence and distribution of the blastomycoses, and the morphological characters of the causal organisms are described, with the addition of cultural observations in the cases of *C. immitis* and *M. dermatidis*. Reproduction is effected solely by means of blastospores, except in the case of *C. immitis*, which also shows mycelial elements.

BERDE (K. v.) & SZENTKIRÁLYI (S. v.). **Ein Beitrag zur Forschung über die Dermatophyten-Flora der ungarischen Tiefebene.** [A contribution to the study of the dermatophyte flora of the Hungarian plain.]—*Arch. für Dermatologie*, cliv, 2, pp. 490–492, 1928.

In continuation of the first-named author's investigations on the incidence of dermatomycosis in the south of Hungary [*R.A.M.*, vi, p. 416], a similar inquiry was instituted during 1926–7 in the north. There was found to be a remarkable paucity of dermatophytes in the latter, where the population largely consists of well-to-do farmers and peasants, as compared with the industrial districts of the south. Among the 34 cases examined there was not a single instance of the human types of *Trichophyton* (represented elsewhere by *T. violaceum*), though the animal species, *T. gypseum asteroides* and *T. faviforme ochraceum* [ibid., vii, p. 636], were sometimes found. *Achorion schoenleini* was the most widespread organism (38 per cent.), while several other common dermatophytes only occurred sporadically.

CATANEI (A.). **Trichophytie expérimentale, à Trichophyton violaceum, du singe d'Algérie.** [Experimental trichophytosis, due to *Trichophyton violaceum*, in the Algerian monkey.]—*Comptes rendus Soc. de Biol.*, xcix, 22, pp. 292–294, 1928.

Trichophyton violaceum [*R.A.M.*, vii, p. 325] was readily inoculated into Algerian monkeys (*Macacus inuus*), which developed an endothrix ringworm of the scalp closely resembling that occurring on man. Details of the condition of the affected animals are given.

BROCQ-ROUSSEU [D.], URBAIN (A.), & BAROTTE (J.). **Cultures de Trichophyton gypseum en dehors de l'organisme et des milieux usuels.** [Cultures of *Trichophyton gypseum* apart from the organism and the ordinary media.]—*Comptes rendus Soc. de Biol.*, xcix, 23, pp. 367–368, 1928.

Continuing their studies on equine ringworms [*R.A.M.*, vi, p. 667

and next abstract], the writers carried out a series of cultures of *Trichophyton gypseum* on a number of materials commonly occurring in bedding, e.g., blades of wheat, oat grains, fragments of wood, hair, horn, and the like. The fungus made good growth in two to three weeks on all these media at laboratory temperature. A dried culture on straw, dating from November, 1925, and resown on Sabouraud's medium in February, 1928, was found to have maintained its vitality and to be pathogenic to guinea-pigs, from the integument of which the organism was reisolated.

Brocq-Rousseu (D.), Urbain (A.), & Barotte (J.). **Cultures du Trichophyton gypseum en dehors de l'organisme et des milieux usuels. (Vitalité et virulence. Remarques épidémiologiques.)** [Cultures of *Trichophyton gypseum* apart from the organism and the ordinary media. (Vitality and virulence. Epidemiological observations.)]—*Ann. Inst. Pasteur*, xlii, 8, pp. 895–906, 2 figs., 1928.

This is an amplified account of the authors' researches on the causal organism of equine ringworm (*Trichophyton gypseum*) [see preceding abstract]. The so-called forms of resistance of this fungus and other dermatophytes are unicellular spores, similar to those formed by species of *Streptothrix*. The occasional occurrence of *Onygena equina* on the hoofs of infected animals suggests the possibility of a genetic connexion between this fungus and those causing ringworm. The results of these investigations also lead to the conclusion that infection by *T. gypseum* and allied organisms may be conveyed by fodders.

Carnevale-Ricci (F.). **Micosi sperimentali dell' orecchio.** [Experimental mycoses of the ear.]—*Boll. Soc. Medico-Chirurgica di Pavia*, N.S., ii, 66 pp., 5 pl., 1927. [Abs. in *Bull. Inst. Pasteur*, xxvi, 10, pp. 444–445, 1928.]

Clinical details are given of the conditions induced in rabbits by inoculation of the ears with *Aspergillus fumigatus* and *Lichtheimia* [*Absidia*] *italiana* of human origin. The symptoms closely resembled those associated with hyperplasic median otitis in man. Spontaneous healing took place in one to three months.

Da Fonseca (O.) & Leão (A. E. de A.). **Contribuição para o conhecimento da Hemispora stellata.** [Contribution to the knowledge of *Hemispora stellata*.]—Reprinted from *Sciencia Med.*, v, 10, 6 pp., 1 pl., 2 figs., 1927. [English translation. Received September, 1928.]

A morphological and cultural study was made of *Hemispora stellata* isolated from sporotrichoid lesions on the arm [*R.A.M.*, v, p. 610], this being apparently the first properly authenticated record of the occurrence of the organism in Brazil.

The well-developed mycelium of the fungus is furnished with a large number of erect, unbranched conidiophores, with septa at wide intervals. At a certain point towards the tip an annular constriction is formed on the conidiophore, and the part above this expands slightly and assumes a cylindrical or allantoid shape. This cell is known as the protoconidium, and its distal end divides

actively to form a chain of rudimentary quadrangular conidia (Vuillemin's 'deuteroconidia'). These become more or less rounded and their walls develop small tubercles or granules. They are set free by disarticulation from above downwards. On carrot, potato, and Sabouraud's media, the colonies are fairly elevated, conical or crateriform, cerebriform, and coffee-coloured.

MORONEI (F.). **Sull' azione patogena di una specie nuova di Fusarium (F. moronei).** [On the pathogenic action of a new species of *Fusarium* (*F. moronei.*)]—*Riv. di Biol.*, x, 1–2, pp. 141–154, 10 figs., 1928.

Full clinical details are given of the author's investigations on a case of pustular dermatitis in a dog caused by a new species of *Fusarium* belonging to the section *Gibbosum*, to which the name *F. moronei* has been given. Inoculation experiments on guinea-pigs and rats fully demonstrated the pathogenicity of the fungus. Pending a complete morphological, cultural, and biological study by Prof. Curzi, the following brief diagnosis is given. The conidia are generally 5-septate but frequently show 3 to 7 and occasionally 0 to 3 or 7 to 9 septa; the apex is long and tapering and a well-marked pedicel is present; the intercalary chlamydospores are globose and occur singly or in groups; the mycelium is white (later yellow) and cottony on Pollacci's medium (on which the best growth was made); a sparse production of sporodochia was observed.

WHITE (R. P.). **An infectious chlorosis of Roses.**—*Plant Disease Reporter*, xii, 4, pp. 33–34, 1928.

Two severe cases of infectious chlorosis of Madame Butterfly, Premier, and Templar roses grown under glass were reported during the winter of 1927–8 from New Jersey and Massachusetts, respectively. Diseased plants suffer from dwarfing, poor root development, inhibition of 'breaks', reduced blooming (only about 10 per cent. of the normal or less), and general lack of vigour. The leaflets are stunted and distorted and the veins and veinlets show a pronounced yellow discoloration, sometimes accompanied by necrosis. Infection may be limited to one side of the leaflet, causing unequal growth of the lamina and consequent bending of the leaf. Isolated areas of infection and severe attacks on the midrib induce puckering of the leaf. The infectious nature of the trouble, which is stated to be in no way connected with insect, fungous, or bacterial attacks, has been demonstrated by its transfer by buds and grafts from diseased to healthy plants of the Briarcliff variety. Ten weeks after the insertion of diseased material the new growth on about 45 per cent. of the originally healthy stock was found to be affected. The adoption of drastic measures is recommended for the eradication of the disease.

WILLIAMS (P. H.). **Botrytis stem rot of the Rose.**—*Thirteenth Ann. Rept. Cheshunt Exper. and Res. Stat., Hertfordshire, 1927*, pp. 41–42, 1928.

During the period under review roses were attacked by a species of *Botrytis*, producing superficial brown scars on the flowering

shoots, which eventually collapsed as a result of girdling. Inoculation experiments on young shoots gave positive results and the causal organism was reisolated from the diseased material. The disease is considered to be only likely to occur under very humid conditions. Care should be taken to prevent the accumulation of water on the young shoots.

WILLIAMS (P. H.). **A bacterial disease of the Chrysanthemum.**—*Thirteenth Ann. Rept. Cheshunt Exper. and Res. Stat., Hertfordshire, 1927,* pp. 32–38, 1928.

In August, 1927, outdoor chrysanthemums were found to be affected by a hitherto undescribed disease characterized by drooping of the flowers owing to the presence of a hollow, brown cavity immediately below the flower head and extending from the capitulum for two or three inches down the stalk. Isolations from the diseased area yielded a practically pure culture of a cream-coloured, rod-shaped bacterium, measuring 1·5 to 2·1 by 0·5 μ, with 1 to 3 polar flagella. The bacterial group number of this organism [the cultural characters of which are described] is B. 211,3332533. Marked resemblances are apparent between this organism and descriptions of *Bacterium exitiosum* (regarded by Gardner and Kendrick as identical with the earlier named *Bact. vesicatorium*) [*R.A.M.*, iii, p. 119], but in the absence of cultures of the latter organism no definite determination can yet be made. Inoculation experiments gave positive results on chrysanthemum, tomato, tobacco, and several other plants.

HAMMARLUND (C.). **Puccinia chrysanthemi Roze und ihre Sporenformen.** [*Puccinia chrysanthemi* Roze and its spore forms.]—*Bot. Notiser, 1928,* 3, pp. 211–220, 6 figs., 1928.

After an historical survey of the literature on *Puccinia chrysanthemi*, the writer reports his studies on the rarely developed teleuto stage of this fungus in Sweden.

The teleutospores observed on the leaves of *Chrysanthemum indicum* measured 35 to 46 by 18 to 24 μ and germinated rapidly (8 to 12 hours) in a decoction of chrysanthemum leaves. The round, hyaline sporidia measured 5 to 6 μ in diameter and produced germ-tubes of varying thickness, sometimes reaching a length of 20 μ in 4 to 8 hours. In addition to the unicellular uredospores, measuring 18 to 25 by 24 to 30 μ, numerous bicellular ones, 18 to 22 by 20 to 35 μ, were observed. Some of the bicellular spores presented the appearance of uredo-teleuto 'twins', the upper cell consisting of a typical uredospore, while the lower one was a teleutospore.

The occurrence of various transitional stages between unicellular uredo- and bicellular teleutospores is considered to prove that the teleuto stage, at any rate as regards *P. chrysanthemi*, is not an independent spore type but merely an advanced type of uredospore.

CORBETT (W.). **A new 'wilt' disease of the Carnation.**—*Thirteenth Ann. Rept. Cheshunt Exper. and Res. Stat., Hertfordshire, 1927,* pp. 42–43, 1928.

Towards the end of 1926 the writer examined some four-months-

old carnation plants showing signs of wilting and presenting a generally stunted appearance. The pith and wood of the wilted stems were brown at the base, suggesting the occurrence of infection below soil level. A species of *Alternaria* and *Clonostachys araucaria* were isolated from the diseased tissues, but only the former proved to be pathogenic. Inoculation experiments with this organism on healthy young carnation plants gave positive results, complete wilting occurring in periods varying from 12 to 30 days (61 days on older shoots). When healthy plants were sprayed with a spore suspension of the fungus, the young leaves and stems developed pale, circular, discoloured lesions with black centres resembling those caused by *A. dianthi*. The optimum temperature for the development of the new fungus on various nutrient media is between 73° and 77° F. It differs from *A. dianthi* in its mode of infection and also in spore dimensions (26 to 103 by 13 to 38 μ, compared with 26 to 123 by 10 to 20 μ).

KÖCK (G.). **Ein für unser Gebiet neuer beachtenswerter Pelargonienschädling.** [A noteworthy *Pelargonium* pest new to our district.]—*Gartenzeit. der Österr. Gartenbaugesellsch. in Wien, 1927*, p. 124, 1927. [Abs. in *Neuheiten auf dem Geb. des Pflanzensch., 1928*, 1, p. 4, 1928.]

Macrosporium pelargonii, the causal organism of a leaf spot of *Pelargonium* hitherto recorded only in California, Denmark, and Northern Italy, has been found in Vienna, where the conidia of the fungus differ somewhat from those described by Rabenhorst. The presence of *M. pelargonii* is considered to constitute a serious threat to Austrian growers of these flowers, and attempts are in progress to control the fungus by means of copper preparations.

PAPE (H.). **Eine Seuche unter dem Löwenmaul.** [A Snapdragon disease.]—*Gartenwelt*, xxxii, 27, pp. 368–369, 3 figs., 1928.

During the last few years the writer has frequently observed the occurrence, in the neighbourhood of Berlin, of the leaf spot of snapdragon (*Antirrhinum majus*) caused by *Phyllosticta antirrhini* [*R.A.M.*, iv, p. 94]. The lesions produced by the fungus are greenish-brown on the green-leaved varieties and brownish-purple on the red-leaved ones. Older lesions are light brown in the centre with darker margins, and present a zonate appearance. The stems are rapidly girdled by spots extending both in a longitudinal and transverse direction, involving the wilting and death of the parts above the point of attack. The unicellular, hyaline, oval to broadly cylindrical spores obtained from diseased material in September, 1927, were found to measure 3·8 to 5·7 by 1·8 to 2·3 μ; they are disseminated by wind, rain, insects, &c. The fungus overwinters in diseased plant débris and in the remains of capsules in the seed. Control measures should include thorough sanitation, seed disinfection with a standard fungicide, and repeated applications of Burgundy mixture.

CAYLEY (D[OROTHY] M.). **'Breaking' in Tulips.**—*Gard. Chron.*, lxxxiii, 2164, pp. 435–436, 2 figs., 1928.

No parasitic organism has yet been traced in connexion with

'breaking' of tulips, a condition characterized by leaf mottling and some degree of stunting, in addition to the well-known variegation of the flowers, but some light was thrown on the problem by a recent series of experiments at the John Innes Horticultural Institution, London.

Bulbs of the May-flowering Bartigon variety, a comparatively resistant crimson 'breeder' [i. e., seedling with flowers of a uniform 'self' colour], were treated in various ways before storage. Some were plugged with tissue from a 'broken' bulb of another variety; others were sliced in half vertically as near the growing point as possible and securely grafted on to a 'broken' bulb of another variety treated in the same manner. The bulbs were then stored, together with controls, for six weeks under ordinary conditions.

Both the above attempts at transmission gave positive results, though plugging injured the bulbs and prevented a good many of them from flowering. The average percentage of 'breaks' induced by the former method was 19·3, compared with 26·6 by the latter. The flowers developing from plugged bulbs showed slight 'parroting' [irregular lobing and splitting of the margin of the petals].

MASSEY (L. M.). **Dry rot of Gladiolus corms.**—*Phytopath.*, xviii, 6, pp. 519–529, 2 pl., 2 figs., 1 graph, 1928.

Dry rot is an important disease of gladiolus corms in the United States and Canada [*R.A.M.*, v, p. 430] and has also been found on specimens from England, France, and Holland.

All the underground parts of the plant may be infected and the stems are often rotted at soil level. This decay of the stem frequently results in a premature yellowing of the tops, which dry up and die. The dry sheathing leaf bases of stored corms affected by dry rot may be abnormally dark and brittle. Affected husks tend to split longitudinally, exposing the diseased corms. The latter bear many circular, reddish-brown (later black), well-defined superficial lesions varying in size from mere dots to areas about 1 cm. in diameter, which may coalesce and involve the entire corm, reducing it to a shrivelled mummy. Cormels produced by diseased plants are commonly affected, the lesions found on removing the hard outer coats resembling those on the corms; mummification during storage frequently results.

The fungus isolated from diseased corms, in which its hyaline hyphae are both inter- and intracellular, was determined as a new species of *Sclerotium*, *S. gladioli*, the morphological and cultural characters of which are described. Sclerotia similar to those produced on stems and husks (or sometimes within the infected tissues of the corms) are readily formed in culture in 10 to 14 days. Measurements of 100 sclerotia in three cultures gave average diameters of 191 by 164, 188 by 161, and 182 by 159 μ, while 100 measured from the stem of a diseased plant averaged 119 by 106 μ. The optimum temperature for growth was found to be 25° C., with a minimum and maximum of 0° and 35°, respectively.

The black sclerotium consists of a definite cortex of thick-walled cells, surrounding thin-walled pseudoparenchyma. White, spherical microconidia, 1·7 to 3·7 μ (average 2·5 μ) in diameter, developed

in a synthetic medium and on potato agar adjusted to P_H 5 by the addition of hydrochloric acid, but were not found in nature. All attempts to germinate these bodies failed, and consequently their rôle in the causation of infection is unknown.

Infection was readily obtained on inoculation and occurs also when corms are planted in diseased soil. A phellogen layer, similar to that observed in *Fusarium* rot [ibid., vi, p. 34], is formed at the juncture of the diseased and healthy tissue.

S. gladioli remains viable in the corms during the winter and is carried to the soil with them at planting time. About 30 per cent. of the progeny of diseased corms planted in clean soil were found to be infected. The pathogen persists in the soil for at least five years. Normally the fungus does not appear to be disseminated in storage, but the percentage of infection is increased when much soil from the field is left adhering to the corms after harvesting.

The only promising control measures appear to be judicious crop rotation, careful selection of planting material, and proper handling of the corms at harvest and in storage.

PAPE (H.). **Folgeerscheinungen der Fliederseuche.** [Consecutive symptoms of the Lilac disease.]—*Gartenwelt*, xxxii, 22, pp. 303–304, 3 figs., 1928.

The writer has studied the symptoms developing in lilac bushes as a sequel to infection by *Pseudomonas syringae* [*R.A.M.*, vii, p. 515]. Since the first attack in the spring of 1924, many of the infected shoots have developed canker-like areas, accompanied by callus formation and curving and bending of the twigs. The concave side of the bent twigs bore dry, dead areas, evidently representing the original seats of infection. The curving was presumably a consequence of the unilateral growth of the twigs owing to destruction of the cambium.

The punctiform, black pycnidia of a species of *Phoma*, probably *P. syringina*, were occasionally found on the dead cortex of infected areas, but they are not believed to be concerned in the causation of the disease.

SMITH (C. O.). **Oleander bacteriosis in California.**—*Phytopath.*, xviii, 6, pp. 503–518, 3 pl., 1928.

For several years the author has been engaged on a comparative study of three organisms responsible for galls on trees, viz., *Pseudomonas* [*Bacterium*] *tumefaciens* (isolated from peach), *P. savastanoi* from olive [*R.A.M.*, v, p. 679] and *P. savastanoi* var. *nerii* n. var., the cause of a disease of *Nerium oleander* [cf. ibid., iii, p. 181] in Californian nurseries.

The oleander organism was grown on the same nutrient media as *P. savastanoi* and showed practically identical cultural characteristics. The P_H limits of growth in peptone meat extract bouillon were the same for both organisms (P_H 5·3 to 8·9). On liquid media both *P. savastanoi* and *P. savastanoi* var. *nerii* develop a fine cloudiness held in suspension, and at times a partial or very thin complete pellicle, or a ring-like formation.

Bact. tumefaciens was found to differ markedly from the olive

and oleander organisms in cultural characters, pathogenicity, and effect on the hosts. On liquid media it produced scarcely any cloudiness, but only a growth of floccules and threads and a more or less dense pellicle. It separated the casein in milk and litmus milk after several days, reducing the litmus and eventually developing a brown liquid coagulum, while the olive and oleander organisms developed varying shades of blue and were devoid of coagulum or whey. On solid agars *Bact. tumefaciens* makes a piled-up growth along the streak, whereas *P. savastanoi* and its variety develop in thin layers and are less watery in appearance. The former does not redden the litmus on dextrose and galactose peptone litmus agars, as do the olive and oleander organisms.

P. savastanoi var. *nerii* produces more or less conspicuous knobby galls on some hosts, while on others open lesions are formed with hypertrophies within or at the margin of the healing tissue. The organism is found in masses in spaces occupied by disorganized tissue but not within the cells. In the oleander the bacterial pockets are readily visible as small, black areas in the greener hypertrophied tissues. Surrounding these pockets are layers of small, thin-walled cuboidal cells, outside which the cells are larger and more flattened. Infection strands develop in the cortex along the long axis of the shoot and into the petioles. The adjacent vessels are rarely infected. Most of the hyperplasias examined were parenchymatous with irregularly scattered vascular elements.

The oleander organism was shown by inoculation experiments to be pathogenic on its natural host, on olive, and on certain plants related to the latter, e.g., *Adelia acuminata* and *Chionanthus virginica*. *P. savastanoi* was pathogenic on the same hosts, with the exception of oleander and the addition of certain species of *Fraxinus* and *Osmanthus* [ibid., ii, p. 12]. Negative results were obtained with both organisms on species of *Prunus, Chrysanthemum frutescens*, and several other hosts of *Bact. tumefaciens*.

On olive the character of the galls produced by the oleander organism differed somewhat from those produced by that from olive knots, and in view of the other differences mentioned it is regarded as a distinct variety of the latter.

KOTILA (J. E.). **Concerning a Rhizoctonia which forms hymenial cells and basidiospores in culture.**—*Science*, N.S., lxvii, 1741, p. 490, 1928.

The author isolated in 1924 a species of *Rhizoctonia* that was fructifying on a lucerne plant affected with root rot in Michigan. The fungus produced its perfect stage in pure culture, and has since continued to form hymenial cells and basidiospores on certain media. Numerous single spore isolations gave cultures of the perfect stage, so that the fungus is considered to be homothallic.

The Michigan strain differs from *R. solani* in its hyaline mycelium and smaller and less numerous sclerotia; these differences are especially pronounced on potato-dextrose agar. The perfect stage is apparently a *Corticium* differing from *C. vagum* [*C. solani*] by the size of its spores and its unusually long sterigmata formed both in culture and on the host.

Bennett (C. W.). **Diseases of fruit and nut crops in the United States in 1927.**—*Plant Disease Reporter, Supplement* 60, pp. 117–222, 4 maps, 1928.

Among the numerous interesting features of this report, which is prepared on the usual lines [*R.A.M.*, vii, p. 175], the following may be mentioned.

Notes are given on the prevalence of, and varietal susceptibility to, a number of the more important diseases of apples, pears, and other fruit trees. Baldwin apples in western New York were affected by a superficial, irregular, dark green or brown blotch at the blossom end. This condition is believed to be almost certainly of physiological origin. Mosaic appears to be increasing in prevalence on apples in New York [ibid., iv, p. 15].

The epidemic of pear blight (*Bacillus amylovorus*) occurring in California in 1927 is reported to have been the most destructive since 1904–5. The estimated loss and expenditure incurred by local fruit growers as a result of this disease amounted to at least $1,000,000 during the year.

Maps are given showing the distribution in the United States of peach yellows, little peach, and peach rosette.

Black root rot of strawberry [ibid., iv, p. 301 ; vii, p. 306] has been reported from Tennessee, Florida, Michigan, Wisconsin, and Washington States, and is also known to occur in Ontario. An extensive study of black root material from Michigan indicates that two organisms are involved in the causation of the disease in that State, one possessing a *Gloeosporium* and the other a *Coniothyrium* type of fruit body. In Florida a root rot believed to be caused by a species of *Fusarium* was more common than usual. Diseases suspected of being of virus origin were reported on strawberries from several States as well as from Ontario. Though generally causing little loss, these diseases continue to engage the interest of American plant pathologists [ibid., vii, pp. 650, 651].

The Erskine Park, Sunbeam, Ohta, and St. Regis (Ranere) raspberry varieties have been found very resistant to mosaic [ibid., vii, pp. 36, 37]. The powdery mildew of this crop (*Sphaerotheca humuli*) is becoming increasingly important in view of the extended cultivation of the highly susceptible red Latham variety. The purple Cardinal and black Munger variety are also reported to be susceptible to mildew.

In a section contributed by H. R. Fulton, a number of diseases [mostly well known] of subtropical fruits are briefly discussed. Four cankers of fig are reported, due, respectively, to *Diplodia* sp., *Macrophoma fici*, *Sclerotinia sclerotiorum* (all three from Texas), and *Tubercularia fici* (from Louisiana) [ibid., iv, p. 610].

Dutton (W. C.), Pettit (R. H.), & Bennett (C. W.). **Spraying calendar.**—*Michigan Agric. Exper. Stat. Special Bull.* 174, 31 pp., 1928.

In this spray calendar for fruit, copious notes are given on the preparation and use of numerous fungicides and insecticides, including oil sprays, emulsions, and dusts, together with information on the cost of spraying apple trees under the conditions obtaining in Michigan. The crops dealt with include apples, pears, cherries,

peaches, plums, grapes, gooseberries, raspberries, and dewberries. The directions are also conveniently presented in tabular form, arranged under the stages of growth at which each application should be made, the materials used, the disease that each treatment is designed to control, and explanatory notes. In the case of apples and pears each of the specified stages of growth is further indicated by a sketch.

Mitteilungen der Schweiz. Versuchsanstalt für Obst-, Wein-, und Gartenbau, Wädenswil. Flugschrift Nr. 5. Baumspritzen. [Communications of the Swiss Experimental Station for Fruit Growing, Viticulture, and Horticulture, Wädenswil. Circular No. 5. Tree sprays.]—*Schweiz. Zeitschr. für Obst- und Weinbau*, xxxvii, 9, pp. 146–160, 11 figs., 1928.

An account is given of a series of experiments conducted at the Swiss Fruit Growing Experiment Station with various types of motor apparatus for the spraying of fruit trees. Particulars are given in each case of the construction, mode of employment, and cost of the appliances, together with other useful information regarding the provision of protective masks, cleaning of the apparatus, and the like.

WALLACE (T.). **Leaf scorch on fruit trees. Part IV. The control of leaf scorch in the field.**—*Journ. Pomol. and Hort. Science*, vii, 1–2, pp. 1–31, 4 pl., 1928.

In this last section of his report on leaf scorch of fruit trees in England [*R.A.M.*, vii, p. 522], the author describes manurial experiments carried out at 13 centres for the general purpose of testing the action of potash manures in cases of leaf scorch; in one or two cases the effects of other manures, especially dung, were also tested. A considerable degree of control of the trouble was obtained in several localities with soils of poor water-holding capacity and low potash supplies, and in one locality with defectively drained clay soil. No experiments were made in leaf scorch areas with close-textured silty soils and with relatively unweathered impervious subsoils, which are occasionally subject to waterlogging, but in one centre belonging to this category applications of potash manures did not give any appreciable result.

Observations at several centres showed that in certain places leaf scorch disappeared after the orchards were 'grassed down', but in such cases the trees practically always exhibited symptoms of acute nitrogen starvation and often remained stunted and useless. Instances are also quoted from the Bromyard area, where the soil is close-textured and silty, in which trees under cultivation developed leaf scorch, while under grass no leaf scorch occurred but the trees were failures and often died completely. These observations lead the author to consider that one of the chief ways in which 'grassing down' reduces leaf scorch is by bringing about lowered nitrogen supplies within the tree, and that this treatment alone will not usually provide a satisfactory remedy in leaf scorch plantations, though on light soils with low potash supply it may often give good results in conjunction with suitable applications of nitrogenous and potassic manures.

In summing up, the author considers that all the evidence so far collected supports the view that leaf scorch results from defective nutrition associated in many cases with unsatisfactory conditions of water supply within the plant.

THOMAS (H. E.). **Root and crown injury to Apple trees.**—*Phytopath.*, xviii, 6, pp. 547–551, 1928.

Further observations [details of which are given] confirm the writer's previous conclusion that *Hypholoma sublateritium* and similar organisms play only a subordinate part in the causation of root and crown injury of apple trees in New York State [*R.A.M.*, vi, p. 498].

REIMER (F. C.). **Pear blight control.**—*Better Fruit*, xxii, 11, pp. 9–10, 28, 1928.

Particulars are given concerning the progress of pear blight (*Bacillus amylovorus*) control in southern Oregon [*R.A.M.*, v, p. 106]. In central California, Bartletts grafted on the resistant Chinese species, *Pyrus ussuriensis*, have developed black-end [ibid., vi, p. 493], but in southern Oregon this disturbance has only been observed under adverse soil conditions. The results of recent investigations indicate the possibility of isolating resistant strains from among the imported French seedlings. Two of the best varieties for use as root stocks are Old Home and Variolosa. A material reduction of blight has been obtained by spraying with Bordeaux mixture (3–6–50), the first application being given during the pink stage and the second directly after the fall of the blossoms.

BECKER (G. G.). **Non-Pear zones and blight eradication.**—*Journ. Econ. Entomol.*, xxi, 3, pp. 485–487, 1928.

In this brief note evidence is brought forward, based on official surveys made during the period from 1922 to 1927, to show that in the apple-growing regions of the Arkansas Ozarks the incidence and severity of pear blight [*Bacillus amylovorus*: see preceding abstract] as a disease of apple trees are being successfully reduced by the eradication of all neighbouring pear and quince trees, a measure which has been made compulsory in certain areas since 1922 by the Arkansas State Plant Board. The progress in the elimination of the disease is apparently limited only by the extent to which local prejudice and lax law enforcement interfere with the work of pear tree eradication. The distance from apple orchards within which pear and quince trees must be removed has been fixed at a mile and a half.

[RICE (W. H.) & MAKGILL (R. H.).] **Control of brown-rot in stone fruits. Experiment with Peach trees at Henderson, 1927–28 season.**—*New Zealand Journ. of Agric.*, xxxvi, 6, p. 419, 1928.

The experiments on the control of the brown rot fungus (*Sclerotinia cinerea*) [*S. fructicola*: see below, p. 744] on peaches were continued during 1927–8 at Henderson, New Zealand, on the same lines as before [ibid., vi, p. 105; vii, p. 252]. On the whole, possibly

owing to a drier summer, the results showed a general improvement, while the relative merits of dry-mix sulphur, sulpho, and atomic sulphur remained unchanged, treatment with these resulting in 0·5, 1 to 2, and 5 to 7 per cent. fruit infection, respectively. The controls which received only the first three applications of spray, showed 3, 5, and 9 per cent. infection, respectively, while trees in neighbouring orchards, which received little or no attention, lost 40 to 60 per cent. of the fruit. Throughout many seasons the best control has been given by the dry-mix spray, and this is considered to be a suitable routine treatment. The formula [loc. cit.] is given.

FISH (S.). **Scab or shot hole of Apricots. Control experiments in the Goulburn Valley. Progress report for 1927.**—*Journ. Dept. Agric. Victoria*, xxvi, 5, pp. 310–312, 1 diag., 1928.

Further experiments upon the control of shot hole of apricots [*Clasterosporium carpophilum*: *R.A.M.*, vi, p. 736], conducted during 1927 in the Goulburn Valley, Victoria, showed that two applications of standard Bordeaux mixture, 6–4–40, to which was added 1 lb. per 100 galls. of lime casein, the first application made either shortly before or after the leaves had fallen, and the second at the pink bud stage, reduced the percentage of scabby fruit from 46·7 on unsprayed, to 6·6 on sprayed trees in a year very favourable to the disease.

WIESMANN (R.). **Untersuchung über die Bekämpfung der Kirschbaumkrankheiten in Eiken (Fricktal) im Jahre 1927.** [Investigation on the control of Cherry tree diseases at Eiken (Fricktal) in the year 1927.]—*Schweiz. Landw. Monatshefte*, vi, 6, pp. 143–149, 7 figs., 1 graph, 1928.

Excellent control of shot hole of cherries [*Clasterosporium carpophilum*] was secured in the Fricktal district of Switzerland in 1927 by a dormant application of 20 per cent. lime-sulphur, followed by three applications of the same preparation at a concentration of 2 per cent. on 14th April (pre-blossom), 6th to 11th May, and 21st to 23rd May, respectively. Where all four applications were given the incidence of infection was reduced from 88 to 8 per cent., while the omission of one or more seriously impaired the efficacy of the treatment. The application of 1 per cent. Bordeaux mixture caused heavy damage to the foliage and cannot be recommended [but see *R.A.M.*, vii, p. 521].

SMALL (T.). **A disease of the Strawberry plant.**—*Thirteenth Ann. Rept. Cheshunt Exper. and Res. Stat., Hertfordshire, 1927*, pp. 45–46, 1928.

Inoculation and reisolation experiments are stated to have proved conclusively that the causal organism of the strawberry disease first observed under glass in 1925 is *Diplodina* [*Didymella*] *lycopersici* [*R.A.M.*, v, p. 616]. The tissues at the base of the leaf petiole become blackened and ultimately collapse, and the young roots are discoloured. Spread throughout the plant is slow, so that newly-formed leaves may remain healthy for a considerable time. The flowers and berries are also affected. Infection was found to

originate mainly in the soil, which should be sterilized by heat after a season of disease in order to prevent reinfection of the new crop. The fungus was found to be most destructive at about 59° F., though infection occurs over a wide range of temperature.

OGILVIE (L.). **'Black tip', a finger-disease of the Chinese Banana in Bermuda.**—*Phytopath.*, xviii, 6, pp. 531–538, 3 figs., 1928.

Further details are given on the occurrence in Bermuda of black tip of Chinese or Dwarf bananas (*Musa cavendishii*) due to the fungus *Cercospora musarum* [*R.A.M.*, vii, p. 185]. A black discoloration first appears just below the flower and progresses down the fruit, reaching a distance of two inches from the tip in about three weeks. The diseased area is often irregular in outline, with an ill-defined zonation, and is bordered by a narrow grey or pale yellow margin. The leaves show minute, circular, black spots and large, brown, lenticular lesions with a bright yellow margin. The latter type of spotting usually begins at some point of injury, e. g., on the mottled areas associated with a *Phyllosticta* (? *musae-sapientii*) [ibid., vi, p. 580]. The disease is most conspicuous from late June to September when the average maximum temperature is above 75° F.

CLARA (F. M.). **Control measures for the anthracnose disease of the Mango.**—*Philipp. Agric. Rev.*, xxi, 1, p. 81, 1928.

Concise directions are given in popular terms for the control of mango anthracnose [*Glomerella cingulata*] in the Philippines [*R.A.M.*, vii, p. 185]. The usual sanitary measures should be supplemented by weekly or fortnightly applications of Bordeaux mixture or some other standard fungicide. The immersion of the mature fruit in 2·5 to 8·5 per cent. solutions of borax (sodium borate) for five to ten minutes before packing led to a decrease of rot in preliminary laboratory tests.

CLARA (F. M.). **A Phytophthora disease of Santol seedlings.**—*Philipp. Journ. of Sci.*, xxxv, 4, pp. 411–425, 4 pl., 4 graphs, 1928.

In August, 1924, a serious disease of santol (*Sandoricum indicum*) seedlings at the Singalong Experiment Station, Manila, was caused by a fungus not hitherto reported on this host. The leaves, young shoots, stems, and cotyledons are attacked, the affected plants eventually collapsing and decaying. In the seedbeds up to 90 per cent. of the plants may be killed during warm wet weather.

A species of *Phytophthora*, with conidia averaging 21·5 to 53·49 by 17·5 to 33·49 μ and oospores from 15·5 to 47·9 μ in diameter, was isolated from the diseased plants. Inoculation experiments with this organism gave positive results on *S. indicum* and also caused slight injury to *Hevea* rubber (on which it was observed in a seed-bed adjacent to the santol), *Brassica juncea*, radish, tomato, eggplant, *Vigna sesquipedalis*, and bean (*Phaseolus* sp.). The morphological and cultural characters of the santol parasite [which are described] agree generally with those of *P. phaseoli* Thaxter

(designated by Leonian as a variety of *P. infestans*) [*R.A.M.*, v, p. 5], and it is accordingly referred to this species.

This disease may be controlled by wide planting, use of sterilized soil for the seed-beds, and repeated applications of 1 in 40 lime-sulphur.

CARUGHI (A.) & PAOLINI (C.). **I mezzi chimici nella lotta contro le malattie delle piante. Fabbricazione, impiego, azione.** [Chemical methods of control against plant diseases. Their manufacture, use, and action.]—358 pp., Milan, Manuale Hoepli, 1928. [Abs. in *Riv. Pat. Veg.*, xviii, 5–6, p. 98, 1928.]

In this work general notes are given on plant diseases and chemical methods of control, separate chapters being devoted to sulphur, copper and its compounds, and various insecticides. The analytical methods for the determination of active substances are described, and the principal diseases of cultivated plants, with their appropriate remedies, are listed.

Statens Redskabsprøver 42. Beretning. Arbejdsprøve med apparater og maskiner til overbrusning af mark- og havekulturer, desinfektion m.m. [Forty-second report of the State experiments with equipment. Working experiments with apparatus and machines for spraying field and garden crops, disinfection, &c.]—157 pp., 64 figs., 19 diags., Copenhagen, A. Bang's Boghandel, 1927. [Received May, 1928.]

This publication contains a large number of valuable data on the technique, mode of application, cost, and efficiency of the various types of spraying and dusting apparatus tested at several places in Denmark under the auspices of the State Machinery Committee during the summer of 1926.

CARR (R. H.) & BE MILLER (L. N.). **Burnt limestones in relation to quality of Bordeaux mixtures.**—*Indus. & Engin. Chem.*, xx, 5, pp. 514–516, 1 fig., 1 graph, 1928.

By means of a special method [the technique of which is described] the writers ascertained the amounts of calcium and magnesium oxides in four series of limes used in the composition of Bordeaux mixtures. It was shown that samples rich in CaO are strongly alkaline and of a bright blue colour, while those containing large quantities of MgO are greenish and much less alkaline. The best suspensions in a commercial series of 32 samples were obtained from a Bordeaux mixture made from lime containing 60 to 70 per cent. CaO and 30 to 40 per cent. MgO.

PRINGSHEIM (E. G.). **Vergleichende Untersuchungen über Saatgutdesinfektion.** [Comparative investigations on seed disinfection.]—*Angew. Bot.*, x, 3, pp. 208–279, 10 graphs, 1928.

A detailed account is given of the writer's investigations on the comparative efficacy of bromine (1 c.c. per 300 c.c. water), 2 per cent. silver nitrate, and 0·25 per cent. uspulun in the total sterilization of the seed of 24 plants belonging to 13 families [cf. *R.A.M.*, v, p. 619].

The experiments were carried out in Erlenmeyer flasks at a uniform temperature. A thorough wetting of the seeds was at first insured in most cases by a preliminary rinsing with alcohol or saponin, but later it was found possible to dispense with this process which is liable to injure germination. On the withdrawal of the seed from the disinfectants, the after-effect of the treatment was checked by washing as follows: twice with water after uspulun; twice with water, one hour's immersion in 1 per cent. sodium chloride, followed by water again, after silver nitrate; and with 0·2 per cent. sodium thiosulphate and two rinsings in water after bromine.

The tests for sterility were made by transferring a number of seeds to a solution of neutral sugar bouillon at 30° C. Germination of the treated seed was also tested in each case.

Some of the seeds were more amenable than others to total sterilization [cf. ibid., vii, p. 41]. The enclosed, one-seeded fruits, viz., *Cannabis sativa, Helianthus annuus,* the Gramineae, and *Fagopyrum esculentum* were more difficult to disinfect than most of the true seeds which tend to have a thicker testa. It was noticeable in the Gramineae that resistance to sterilization does not increase in proportion to the thickness of the glumes.

Each of the disinfectants used possessed certain advantages over the others. Silver nitrate proved highly injurious to the Cruciferae, which were benefited by treatment with uspulun, while the reverse was the case with the Gramineae. Bromine was almost uniformly injurious to the seeds, but was valuable in the treatment of bean (*Phaseolus vulgaris*) seeds, the seed-coats of which were damaged by immersion in the other solutions used. Like chloride of lime (used in a few of the tests) bromine has the advantage of rapid action. On the whole, silver nitrate gave the best results, sterilizing 21 out of the 24 species of seeds on which it was tested (87 per cent.), the corresponding figures for uspulun and bromine (each used on 26 species) being 17 and 12 (65 and 46 per cent., respectively).

Numerous micro-organisms were isolated from the inadequately disinfected seeds. In those treated with uspulun Aspergillaceae predominated, while spore-forming bacteria were more in evidence in seeds treated with silver nitrate.

A bibliography of 46 titles is appended.

Sorauer (P.). **Handbuch der Pflanzenkrankheiten.** [Handbook of plant diseases.]—5th Ed., Berlin, Paul Parey, 1928.

Of the 5th Edition of this well-known work [*R.A.M.*, iii, p. 94] three volumes have already appeared and three others are in preparation. The former include Vols. I (non-parasitic diseases), II (the first part of the diseases caused by plant parasites), and IV (the first part of those caused by animal parasites). Vols. III and V (completing the plant and animal parasites, respectively) are promised for the winter of 1928–9, and VI (plant protection) by the end of the latter year.

The first part of the plant parasites comprises a section of 295 pages on bacterial plant pathogens by C. Stapp, followed by 442

pages covering the fungi down to the Discomycetes and divided into sections written by Riehm, Höstermann, Noack, Köhler, Laubert, and Wollenweber. The volume, therefore, consists of 737 pages as compared with 377 in the corresponding part of the 4th Edition, showing the great amount of new matter that has been incorporated. The bacterial section, for instance, is more than three times as long as that in the previous edition, but that it still does not exhaust the field is evident from the fact that only 48 natural orders (arranged according to the system of Engler & Prantl) are mentioned as afflicted with bacterial diseases, against 60 listed by E. F. Smith in the 'Bacterial diseases of plants' in 1920. Nevertheless the literature down, at least, to 1926 has been so well combed that the section is the most comprehensive account of these diseases as yet published. Migula's system of nomenclature is adopted, that proposed by the Society of American Bacteriologists [ibid., iii, p. 18] being rejected. In the accounts of each disease, the cultural characters of the pathogen are regularly summarized and the more important literature is conveniently and fairly fully cited at the bottom of the pages. Some serious errors or omissions occur, as where the Java 'gomziekte' of sugar-cane is attributed to *Bacterium vascularum*, scald being omitted as a distinct disease, while the identity of the cause of the bacterial wilt of bananas, formerly known as *Bacillus musae*, with *Bact. solanacearum* is not recorded.

In the sections dealing with fungi Köhler includes the Plasmodiophoraceae under the Chytridiineae [see below, p. 744]. The more important diseases are described at considerable length, control measures being very fully discussed. Noack is responsible for most of the parts dealing with the Ascomycetes, special sections being also contributed by Laubert and Wollenweber. *Trichosphaeria sacchari* is given as the perfect stage of *Melanconium sacchari*, and *Colletotrichum falcatum* as well as *Thielaviopsis paradoxa* are apparently also thought to be possibly related to the first two: hence the note on sugar-cane rind disease is very confusing. The *Rosellinia* root disease of tea is attributed to *R. radiciperda*, and there are few references to the ascomycetous parasites of importance in the tropics, though those common in Europe are fully discussed. In spite of these weaknesses, especially apparent in the sections contributed by Noack, the volume as a whole marks a distinct advance on any European handbook as yet produced and is to be considered as an essential addition to the plant pathologist's library.

Allen (Jessie M.). **Author and subject index to the publications on plant pathology issued by the State Agricultural Experiment Stations up to December 1, 1927.**—*U.S. Dept. of Agric. Library, Bibliogr. Contr.* 16, 251 pp., 1928.

The 'Check List of Publications of the State Agricultural Experiment Stations on the Subject of Plant Pathology, 1876–1920', issued in 1922, being now exhausted, it was decided to publish the present author and subject index covering the publications of the same institutions on phytopathology (exclusive of insect

pests) up to 1st December, 1927. The subject entries are in a single alphabetical index covering both hosts and parasites and also including certain general and physiological aspects of the subject. Most of the series of papers begin about 1887, when the Hatch Act grant for State agricultural experiment stations came into force. Since 1914, many technical papers contributed by the stations have been published in the *Journal of Agricultural Research,* and these are included in the index, from which certain anonymous and popular material has been omitted.

Brooks (F. T.). **Disease resistance in plants.**—*New Phytologist,* xxvii, 2, pp. 85–97, 1928.

In this paper on disease resistance in plants the author discusses in popular terms immunity due to the structural character of the host; physiological immunity; the nature of the struggle between resistant host and parasite; the formation of cork and gum barriers; the effects upon resistance of weather and soil conditions; the existence of 'carriers'; and the prospects of breeding resistant varieties of plants, these points being illustrated by reference to a number of well-known plant diseases.

Beauverie (J.). **Quelques aspects de la dégénérescence des plastes, applications au parasitisme. I. Observations sur le vivant.** [Some observations of the degeneration of plastids and their applications to parasitism. I. Observations on living material.]—*Rev. Gén. de Botanique,* xl, 472, pp. 206–225; 473, pp. 264–276, 8 figs., 1928.

The author, after a study of the proceedings leading to the degeneration of the plastids in plant cells, gives some examples of the action of fungous parasites on these bodies. He distinguishes two cases, one in which there is a degeneration of the plastids, and a second in which these are, on the contrary, preserved beyond their normal period of activity. In the former case the leucoplasts become vesicular and the chloroplasts are fragmented, become granular, and dissolve. This action is apparently due to a disturbance in the osmotic pressure of the cell, usually the result of an increased concentration of the sap, the fungus taking up water from the cells and possibly also secreting enzymes which cause an increased pressure through their action on the cell contents. The oil drops developing in the degenerating plastids are not regarded as due to any secretory activity of these bodies as suggested by Kharbush [*R.A.M.*, v, p. 660], but rather to a separation out of pre-existing lipoids resulting from the osmotic disturbance. The relative facility with which oil becomes thus liberated may be one of the factors of resistance or susceptibility to fungal attack, since the oil serves as a nutrient substance for the fungus. A similar process may involve the proteid contents of the plastids.

In the 'green island' phenomenon associated with the attacks of many fungi [ibid., vi, p. 632], the persistence of the chloroplasts is apparently due to their fixation as a result of parasitic activity, but the details of this are not discussed.

Reiling (H.). **Die Anerkennung der Pflanzkartoffel.** [The certification of the seed Potato.]—*Fortschr. der Landw.*, iii, 10, pp. 438–441, 1928.

In this paper some general considerations are set forth on the theory and practice of the certification of seed potatoes in Germany, with special reference to the detection of the so-called degeneration or virus diseases.

Hadfield (J. W.). **Certification of seed Potatoes.**—*New Zealand Journ. of Agric.*, xxxvi, 5, pp. 324–330, 4 figs., 1928.

Referring to the system of certification of seed potatoes recently introduced into the district of Canterbury, New Zealand [*R.A.M.*, vii, p. 113], which has met with so much support that it is to be extended, the author briefly describes attempts that have been made locally to standardize varietal nomenclature. It is considered doubtful whether the original Sutton's Supreme variety is now grown commercially in New Zealand, as it probably lost favour in Canterbury after the severe invasion of late blight [*Phytophthora infestans*] in 1905. The wide range of variation possessed by Dakota may be partly due to virus diseases; an attempt is being made to certify the most uniform and disease-free crops of this variety.

Whitehead (T.) & Morris (O. R.). **Field trials with Welsh seed Potatoes.**—*Welsh Journ. of Agric.*, iv, pp. 269–280, 4 figs., 1928.

From a survey of potato stocks grown consecutively for several years in North Wales, localities have been discovered free from the insects which spread virus diseases, where it is thought potatoes suitable for seed may be produced. Instances are cited of potatoes grown without change of seed for long periods (up to sixty years) which still show no symptoms of disease [*R.A.M.*, iii, p. 737].

The authors describe trials to test the potentiality of selected centres for seed potato production, the criteria being (*a*) the maintenance of yield and (*b*) the freedom from virus diseases. Seed from six centres grown for 2 to 14 years consecutively was planted in chequerboard plots, the varieties used being Kerr's Pink and Great Scot, with Arran Chief from one locality. All the varieties were tested against Scotch seed.

The results of the trials [which are tabulated and discussed in detail] showed that in several instances the Welsh seed cropped as well as the Scotch, and in two cases gave heavier yields than the latter. With one exception, all the Welsh seed gave at least as high a proportion of ware and ware plus seed as did the similarly treated Scotch seed. The total percentage of virus infection in some of the Welsh stocks was considerably higher than in the new Scotch seed, but as most of the infection was common mosaic, it had little effect on yield. In view of the length of time during which the Welsh stocks had been grown, in most cases without supervision, it is considered probable that healthy stocks could have been maintained on the farms concerned by such measures as roguing and early lifting [ibid., vi, p. 573].

In the author's opinion these trials show that good seed potatoes can be grown at selected localities in North Wales.

Krebsfeste Kartoffelsorten. [Wart-immune Potato varieties.]—*Oesterr. Zeitschr. für Kartoffelbau, 1928,* 1, pp. 6–8, 1928.

In his account of ten years' experiments on testing and breeding potatoes for immunity from wart disease [*Synchytrium endobioticum*] in Czecho-Slovakia, Prof. F. Morgenstern enumerates (*Landw. Fachpresse f. d. Tschechoslowakei*, 9) 32 varieties as immune, 14 as almost immune, and nearly 100 as susceptible. The first group includes Arran Rose, Great Scot, Green Mountain, Idaho Rural, Irish Cobbler, Industrie, Jubel, Kaiserniere, Kerr's Pink, Rhoderick Dhu, Roode Star, and Tinwald Perfection.

Roach (W. A.) & Glynne (Mary D.). **The toxicity of certain sulphur compounds to Synchytrium endobioticum, the fungus causing wart disease of Potatoes.**—*Ann. of Appl. Biol.*, xv, 2, pp. 168–190, 8 diags., 1928.

The investigation described in detail in this paper was undertaken for the purpose of determining the relative toxicity to the winter sporangia of *Synchytrium endobioticum* of certain of the simpler sulphur compounds which are likely to be formed when sulphur is added to soil, in the attempt to solve the problem presented by the great variability in the fungicidal action of sulphur on this organism noted in earlier experiments [*R.A.M.*, vii, p. 342]. A list of the sulphur compounds tested is given in a table, and their toxicity to the fungus was compared to that of sulphuric acid taken as a standard.

The toxicity of sulphuric (H_2SO_4), sulphurous (H_2SO_3), dithionic ($H_2S_2O_6$), trithionic ($H_2S_3O_6$), tetrathionic ($H_2S_4O_6$), and pentathionic ($H_2S_5O_6$) acids was found to be of the same order at the same hydrogen-ion concentration, while their neutral salts were non-toxic, thus suggesting that the toxicity of these acids is mainly due to their hydrogen-ion concentrations. Acidified solutions of sodium thiosulphate ($Na_2S_2O_3$), sodium hydrosulphite ($Na_2S_2O_4$), and sodium formaldehyde sulphoxylate ($NaCH_3SO_3$) were about ten times as toxic as sulphuric acid, all the evidence tending to suggest that the toxicity of these acidified solutions, in excess of that which may be accounted for by the hydrogen-ion concentration, is due to the thiosulphuric acid ($H_2S_2O_3$) present in each of them, or to some compound closely related to thiosulphuric acid which is formed from it on acidification. This conclusion is, however, considered only as tentative, in view of the instability of some of the compounds which occasioned considerable experimental difficulties in testing their fungicidal properties.

Of the other compounds tested, sodium hydroxide was found to be slightly more toxic than sulphuric acid, and persulphuric acid about ten times as toxic. Hydrogen peroxide, calcium polysulphide, and sulphuretted hydrogen were only slightly toxic to the sporangia.

Esmarch (F.). **Untersuchungen zur Biologie des Kartoffelkrebses. III.** [Investigations on the biology of Potato wart. III.]—*Angew. Bot.*, x, 3, pp. 280–304, 1928.

Continuing his investigations of the physiological processes influencing the germination of the sporangia of the potato wart fungus (*Synchytrium endobioticum*) [*R.A.M.*, vi, p. 635], the author found that the resting sporangia can germinate at a temperature range of 5° to 30° C., or slightly above: for the most part, however, germination occurs between 14° and 24°, with an optimum at 19° to 20°.

Zoospore infection is possible at 12° to 24°. This is considered to be a remarkable instance of adaptation of a parasite to its host, since the susceptible organs of the potato develop particularly well at approximately the same temperature range (15° to 22°).

Measurable growth of the wart excrescences was observed at 3·5° to 30°, and the conclusion was drawn that both the germination of the sori and secondary infections through the zoospores liberated by these organs are possible within these limits.

Resting sporangia were found to develop at low soil temperatures in the spring and sori at high ones at midsummer, though in the normal life-history the reverse is the rule. It would seem, therefore, that the influence of temperature on these processes is not decisive. Contrary to Salmon's observations (*Rept. South-eastern Agric. Coll., Wye*, 1908), the maturation of the resting sporangia was not accelerated by freezing. The temperature requisite for the destruction of the resting sporangia varies with individuals, and also with the duration of exposure. An hour at 70° C. was found to be sufficient to destroy the great majority of the resting sporangia.

Sporangial germination was experimentally shown to be definitely promoted by dilute solutions of nitrogenous salts as well as by Knop's and Schmidt's nutrient media. This explains the previous observation that certain soil extracts stimulate germination. An increased supply of oxygen was also found to accelerate the germination of the sporangia. Natural disinfection of the soil will, therefore, be favoured by all cultural measures tending to enrich the oxygen supply and thus to secure complete sporangial germination.

Reddick (D.). **Blight-resistant Potatoes.**—*Phytopath.*, xviii, 6, pp. 483–502, 1928.

From 1921 to 1927, inclusive, the self-fertile Japanese potato variety, Ekishirazu, has remained highly resistant to blight (*Phytophthora infestans*) in a series of trials [details of which are given] at Ithaca, New York. Owing to various undesirable qualities, this variety has no commercial possibilities in the northern States and Canada, but hybrids between Ekishirazu and certain other varieties, e.g., Irish Cobbler and some unnamed Alsatian strains, have yielded 46 families of plants combining the resistance of the Japanese potato with other valuable qualities. Some of these will be widely distributed for testing under diverse conditions.

The writer's observations in the course of these experiments

point to a low order of parasitism and the absence of biological specialization in *P. infestans*. The work of previous investigators on these aspects of the disease is summarized and discussed.

Evidence is adduced in support of the view that late blight is not endemic in South America, but was introduced there and into Europe on some other Solanaceous host, possibly tomato.

WEISS (F.), LAURITZEN (J. I.), & BRIERLEY (P.). **Factors in the inception and development of Fusarium rot in stored Potatoes.**—*U.S. Dept. of Agric. Tech. Bull.* 62, 35 pp., 6 pl., 4 graphs, 1928.

Terminal market inspection reports from 17 States producing a surplus of late potatoes indicate that the total annual loss from *Fusarium* rot amounts to between 5 and 10 per cent. (over 3,000,000 bushels), while occasional losses for individual States up to 25 per cent. have been reported to the Plant Disease Survey.

Infection by *Fusarium* spp. begins in cuts, bruises, skin abrasions, and similar injuries inflicted in handling about twice as often as in lesions due to all other sources, including late blight (*Phytophthora infestans*) and frost.

The species of *Fusarium* most frequently implicated in the decay of stored potatoes are *F. coeruleum*, *F. sulphureum*, and *F. trichothecioides* [*R.A.M.*, vii, p. 466]. The last-named species is predominantly western in distribution, while the others occur more in the north, *F. coeruleum* at any rate having been reported from eastern Canada and New England to the Pacific Coast. *F. eumartii*, *F. radicicola*, and *F. oxysporum*, all markedly pathogenic to potatoes at higher temperatures, can initiate only slight and transitory infection at storage temperatures (below 10° C.). On the other hand, *F. sulphureum* and *F. coeruleum* are capable of starting infection and causing progressive decay down to practically the lowest temperature which can safely be employed in potato storage. *F. coeruleum* can cause infection at 50 per cent. relative humidity at 6·7°.

No material difference in susceptibility to infection or rate of decay was found between mature recently dug potatoes and those stored (under conditions that maintained their dormancy) until the end of April.

A striking difference in the rate of healing of cuts was observed between varieties of the Rural New Yorker group, in which the process is slow, and the rapidly healing Irish Cobbler and Spaulding Rose. In Rural New Yorker the following periods are required at the temperatures stated for the production of a wound periderm capable of excluding *F. coeruleum* and *F. sulphureum*: 21°, 3 or 4 days; 15·5°, 5 or 6 days; 10°, more than 8 days; below 10°, more than 10 days. In Spaulding Rose a period of 1 to 3 days suffices at 21° and 15·5°, but more than 10 days are necessary at temperatures below 10°.

It is concluded from these investigations that *Fusarium* rot cannot be prevented simply by the manipulation of the temperature and humidity of the storage-room. Mechanical injury should be reduced to a minimum by careful handling of the tubers, which

should be kept as dry as possible for at least the first four weeks of storage. Under suitable conditions of storage, especially as regards the provision of ample ventilation, the temperature need not be lower than 4·4° to 7°, and humidity (which within ordinary ranges was not found to influence infection materially) should be maintained at a reasonably high level to preserve the quality of the tubers.

GILBERT (B. E.) & MCLEAN (F. T.). **A 'deficiency disease': the lack of available manganese in a lime-induced chlorosis.**—*Soil Science*, xxvi, 1, pp. 27–31, 1928.

In continuation of their previous experiments in the control of lime-induced chlorosis, resulting from the lack of available manganese, of various crops at the Rhode Island Agricultural Experiment Station [*R.A.M.*, vi, p. 284], the authors obtained excellent results during 1926 and 1927 by the application of manganous sulphate (30 lb. per acre) to crops of maize, lettuce, onions, mangolds, and various fodder grasses in nearly neutral, chlorosis-inducing soils. A supplementary experiment with spinach and autumn beets showed that manganous sulphate gives better results when applied in solution than when mixed with the chemical fertilizer.

BRIERLEY (W. B.). **The micro-flora of the soil.**—*Journ. Quekett Microscop. Club*, xvi, 94, pp. 9–18, 1 pl., 1928.

In this paper the author briefly summarizes the present status of knowledge concerning the kinds, number, and activities of the microflora of the soil, i. e., algae, bacteria, and fungi. Some four years ago the tabulated records of soil fungi included species belonging to 11 genera of Phycomycetes, 8 of Ascomycetes, and 62 of Fungi Imperfecti. The writer's own experience has led him to conclude that these numbers represent only a small proportion of those actually occurring in the soil. No evidence has been found, in the examination of sandy, chalky, and stiff clay soils at the Rothamsted Experimental Station, of distinct fungus associations governed by edaphic factors. Beyond a suggestion of lower numbers in winter than in summer, no convincing proof has hitherto been obtained of any seasonal periodicity in the development of soil organisms. Most of the fungi investigated have been found in the superficial layers of the soil [see next abstract], the numbers declining rapidly below 6 to 10 inches, while at a depth of 3 feet practically no organisms are present. The species occurring at the greatest depths are *Penicillium*, *Fusarium*, and *Saccharomyces* spp., *Zygorrhynchus vuillemini*, and *Trichoderma koningi*.

LE CLERG (E. L.) & SMITH (F. B.). **Fungi in some Colorado soils.**—*Soil Science*, xxv, 6, pp. 433–441, 1928.

The dominant type of fungous flora in Colorado soils appears to consist of species of *Penicillium*, followed by *Trichoderma*, while *Aspergillus* is only sparingly represented. Species of *Cephalosporium*, *Verticillium*, *Spicaria*, *Hormodendrum*, *Macrosporium*. and *Stachybotrys* occur occasionally.

A study of 27 soils [the results of which are tabulated] indicated

that soils with a low moisture content favour the growth of *Rhizopus nigricans* and *Trichoderma lignorum*. *P. expansum* and the other species enumerated occur in soils with varying degrees of moisture from 1·9 to 5·5 per cent.

Apart from *Penicillium* spp. (especially *P. expansum* and *P. lilacinum*), *Macrosporium* sp., and *Cephalosporium* sp., the number of fungi isolated from soils containing high quantities of soluble salts was considerably less than from soils with a low salt content. *T. lignorum* and *R. nigricans* were abundant only in soils of low salt content, while *P. expansum, P. roseum, P. lilacinum, P.* No. 55, and *Fusarium* sp. occurred in small numbers under these conditions.

R. nigricans and *P. expansum* were common to both productive and barren soils, but more abundant in the latter. Greater numbers of *Fusarium* sp. were isolated from fertile than from unproductive soils.

The number of species found decreased with the depth of the soil [see preceding abstract]. Only two species, *T. lignorum* and *P. expansum*, were isolated at 42 inches. *A. niger* occurred in profusion only at the surface. *Spicaria simplicissima, Hormodendrum pallidum,* and several of the species of *Penicillium* enumerated were isolated only from the sub-soil, but *P. roseum* and *P.* No. 50 were found at the surface.

RAGUNATHAN (C.). **Bacterial leaf spot of Betel.**—*Ann. Roy. Bot. Gard., Peradeniya*, xi, 1, pp. 51–61, 2 pl., 1928.

This is a fuller account of the writer's investigations on the leaf spot of betel (*Piper betle*) caused by *Bacterium betle* n. sp. than that already published [*R.A.M.*, vi, p. 119]. A technical description of the organism is given. It occurs in the form of cylindrical rods, solitary or in pairs, or in short chains on 20-days-old Bovril broth; the cells are 0·5 by 1·5 to 2·5 μ, non-motile, without spores or capsules, honey-yellow, shiny, viscid in mass, and Gram-negative. Good growth occurs on Bovril agar, little in Cohn's or Uschinsky's solutions, and none in Fermi's. Gelatine is liquefied, starch reduced, and desiccation resisted for three days. The group number of the organism, according to the chart of the Society of American Bacteriologists, is 211.0000514.

GOUAUX (C. B.). **Sugar Cane test field work.**—*Louisiana Agric. Exper. Stat. Bull.* 202, 32 pp., 1 graph, 1928.

In a recent series of experiments conducted in various parts of Louisiana, a high degree of resistance to mosaic was shown by the P.O.J. 213 variety of sugar-cane, while P.O.J. 234 and 36 were susceptible. P.O.J. 228 and 979 also proved highly resistant, but P.O.J. 826 and 2379 showed heavy infection [cf. *R.A.M.*, vii, p. 474].

Red stripe [*Phytomonas rubrilineans*: loc. cit.] occurred on Cayana, D-74, Purple, and P.O.J. 36, 213, 228, and 234 at the Baton Rouge Experiment Station. In the test plots at Reserve, P.O.J. 228 showed 20 per cent. infection, 2379 15 per cent., and 826 traces. Elsewhere the same varieties together with P.O.J. were attacked.

HADDEN (F. C.). **Sugar Cane mosaic and insects.**—*Hawaiian Planters' Record*, xxxii, 1, pp. 130–142, 1928. [Repr. in *Facts about Sugar*, xxiii, 32, pp. 758–762, 1928.]

From April, 1925, to May, 1927, the author was engaged on a series of investigations on the relations between insects and sugar-cane mosaic.

The experiments were carried out on plants grown in eight-inch pots in insect-proof cages. For the first six months only seedlings of sugar-cane and grasses were used, but later Striped Tip and Yellow Tip seed-pieces were employed. The evidence collected in these experiments indicates that sugar-cane mosaic is identical with the form of mosaic disease occurring on other Gramineae in Hawaii.

Two insects were found to transmit the disease in these tests, namely, *Aphis maidis* from various grasses to sugar-cane and other grasses, and *Peregrinus maidis* from maize to maize and in one case from maize to Striped Tip cane [cf. *R.A.M.*, vii, p. 160]. On the other hand, *A. sacchari*, *Perkinsiella saccharicida*, *Stictocephala festina*, *Draeculacephala mollipes*, and *Tetranychus exsiccator* repeatedly failed to carry mosaic from diseased to healthy plants.

Under ideal conditions (which are only approached on sorghum, maize, and Sudan grass (*Holcus sudanensis*) [*Andropogon sorghum* var. *sudanensis*]), the offspring of one female of *A. maidis* may amount to over 1,000,000 in two months. The reproduction of this species has been observed, either in nature or under experimental conditions, on 34 Gramineae, including sorghum, sugar-cane, wheat, oats, barley, maize, and various species of *Panicum*, *Syntherisma*, and *Chloris*.

Transmission of mosaic to cane over two months old was found to be very difficult, and could usually be effected only by the exposure of the tender inner leaves of the spindle to the insect's proboscis. So far it has been found impossible to transmit mosaic from cane to any other grasses owing to the difficulty of rearing the aphids on mosaic cane. The Golden Bantam variety of maize used in the tests showed the mosaic markings very clearly. For every successful experiment at least three to five, and sometimes twenty to thirty failures were recorded, especially during the hotter summer months. The maximum temperature for the transmission of infection is thought to be near the average for the three cooler winter months. Mosaic was successfully transmitted between the following hosts: maize to maize, Striped Tip, and OP26 × ST. H109 cane, and bristly foxtail (*Chaetochloa* [*Setaria*] *verticillata*); sorghum to sorghum, maize, *S. verticillata*, chase grass (*Valota insularis*), *Syntherisma chinensis*, and Striped Tip Yellow Tip, and OP5 ST × H 109 cane; *S. verticillata* to the same host, maize, sorghum, and Striped Tip, Yellow Tip, YT × H 109, OP5YT × H 109, and OP6ST × H 109 cane; *S. sanguinalis* [*Panicum sanguinale*] to OP6ST × H 109; and Sudan grass to Striped and Yellow Tip cane.

Both winged and wingless individuals were found to transmit mosaic. Large numbers of aphids are killed by fungi in damp weather, and the Australian ladybeetle (*Coelophora inaequalis*) also

helps to reduce this pest. The incidence of mosaic may be greatly minimized by cutting the grasses before they flower and covering up the weed pile (which should be placed as far as possible from the growing cane) with fine dust.

FAWCETT (G. L.). **Apuntes sobre el mosaico de la Caña de Azúcar.** [Observations on Sugar-cane mosaic.]—*Rev. Indust. y Agric. de Tucumán*, xviii, 11–12, pp. 205–209, 1 fig., 1928.

Recent observations and experiments have demonstrated that the sugar-cane varieties P.O.J. 2714 and 2725 are virtually immune from mosaic in Tucumán (Argentine). The proportion of infection in plantations grown from diseased seed of the latter variety was only a little higher than that occurring where selected healthy seed was used (3·7 compared with 1·2 per cent. in one case and 4 as against 2 per cent. in another) [*R.A.M.*, vii, p. 562].

Referring to Yoder's statement that mosaic occasionally occurs in certain highly resistant varieties of sugar-cane [ibid., v, p. 764], the writer has found no trace of this disease in the group of immune varieties under his observation, viz., Kavangire (cultivated since 1909), Yon Tan San, Tek Chah, two strains of Uba, Zwinga (since 1910), and S.P.I. 33,243.

STEVENS (F. L.). **Fungi from Costa Rica and Panama.**—*Illinois Biol. Monographs*, xi, 2, 102 pp., 18 pl., 2 maps, 1927. [Received September, 1928.]

The 123 Central American fungi recorded in this paper were collected by the author in 1923. Most of them are leaf parasites, though the Meliolineae, Microthyriaceae, rusts, and various other groups are held over for subsequent publication. Several new genera and a large number of new species are described, and for the most part admirably illustrated.

LIND (J.). **Micromyceter fra Åreskutan.** [Micromycetes from Åreskutan.]—*Svensk Bot. Tidskr.*, xxii, 1–2, pp. 57–81, 1928.

This is a list of 242 fungi, mostly parasitic species, recorded from Åreskutan [Norrland, Norway]. A bibliography of 59 titles is appended.

STEVENS (F. L.). **The Meliolineae I & II.**—*Ann. Mycol.*, xxv, 5–6, pp. 405–469, 2 pl., 1927; xxvi, 3–4, pp. 165–383, 5 pl., 1928.

This important work aims at being a complete monograph of the group. The author recognizes 7 genera, of which *Irenopsis* and *Irenina* are new while *Actinodothis* Syd., which was referred by Theissen and Sydow to the Dothideales, is now placed in the Meliolineae. At the beginning of each genus there is a conspectus of all the included species. A new modification of the Beeli formulae is introduced, and each species is marked with the appropriate diagnostic numerals.

The author accepts 713 species, and rejects from the group 45 species previously included. Amongst the provisionally accepted species are 10 of *Leptomeliola* von Höhnel and *Meliolopsis* Beeli (though Beeli's type species is excluded): they are characterized

by persistent, 8-spored asci, and the author is of opinion that it will ultimately prove that these species are founded on *Meliola* mycelium parasitized by another fungus. There is a host index of 35 pages arranged under the Natural Orders, and an alphabetical list of the specific names of the fungi.

HONEY (E. E.). **The Monilioid species of Sclerotinia.**—*Mycologia*, xx, 3, pp. 127–157, 3 pl., 4 figs., 1928.

After a somewhat detailed historical review of the literature and a discussion on the taxonomy of the genera *Ciboria*, *Sclerotinia*, *Stromatinia*, and *Rutstroemia* (the last two of which are considered to be non-valid), the author points out the close similarity of all the species having conidial stages belonging to the form genus *Monilia* as distinct from those that have a *Botrytis* or *Botrytis*-like stage in their life-history. For the former group the new genus *Monilinia* (synonyms *Sclerotinia* Fuckel *pro parte* and *Stromatinia* Boudier *pro parte*) is created, with *M. fructicola* (Wint.) Honey (*S. fructicola* (Wint.) Rehm) as the type species [*R.A.M.*, vii, p. 32].

COOK (W. R. I.). **Quelques observations sur le genre Ligniera.** [Some notes on the genus *Ligniera*.]—*Bull. Soc. Myc. de France*, xliv, 1, pp. 105–108, 1928.

In these further notes on the genus *Ligniera* [*R.A.M.*, vii, p. 339] the author states that he does not agree with Guyot's suggestion [ibid., vi, p. 753] that *L. verrucosa* and *L. junci* should be reunited in one species, since the spores of the former bear characteristic warts which he has never observed on those of the latter. The fact that the roots of *Beta maritima* grown in moist soil containing spores of *L. junci* became readily infected supports his view that *Sorolpidium betae* Nemec was a mixture of *L. junci* and *Asterocystis radicis*, and he considers, therefore, that the former name should be discarded.

In view of the frequent association of fungi belonging to the Chytridiaceae with members of the Plasmodiophoraceae, stress is laid on the differences that exist in the nuclear division [cytological details of which are given] of the latter as compared with all other lower fungi.

CURZI (M.). **De novis Eumycetibus.** [Concerning new Eumycetes.]—*Atti Ist. Bot. R. Univ. di Pavia*, Ser. III, iii, pp. 203–208, 2 pls., 1927. [Received 1928.]

The author describes twelve new species of fungi with Latin diagnoses, amongst which are *Phomopsis eriobotryae* on leaves of loquat (*Eriobotrya japonica*) and *Colletotrichum psidii* on living leaves of guava (*Psidium guajava*).

GADD (C. H.) & BERTUS (L. S.). **Corticium vagum B. & C.—The cause of a disease of Vigna oligosperma and other plants in Ceylon.**—*Ann. Roy. Bot. Gard., Peradeniya*, xi, 1, pp. 27–49, 4 pl., 1928.

This is an amplified account of the authors' investigations on the *Rhizoctonia* disease of *Vigna oligosperma* and other plants in Ceylon caused by *Corticium vagum* [*C. solani*: *R.A.M.*, v, p. 517].

The mycelial stage of the fungus has been found on rice, plantain (*Musa paradisiaca*), and *Acacia decurrens*, and both the imperfect and perfect stages on groundnut. The morphological and cultural characters of the various strains from different hosts are fully described, and the results of the cross-inoculation experiments are tabulated. Some general suggestions are made for the control of the disease.

GADD (C. H.). **Report of the Mycologist.**—*Tea Res. Inst. Ceylon Bull.* 2 (*Ann. Rept. for the year 1927*), pp. 7–18, 1 pl., 1928.

The root disease caused by *Poria hypolateritia* is stated to be making steady progress and causing very serious damage in Ceylon [*R.A.M.*, vi, p. 644; vii, p. 543]. This is probably due to the fact that many diseased bushes show no aerial symptoms and escape eradication: an examination of the roots is necessary in all cases of suspected infection by the fungus in question.

Diplodia disease [*Botryodiplodia theobromae*: ibid., vii, p. 275] is probably the most prevalent root disorder occurring at medium and low elevations. There is some indication that the incidence of this disease may be reduced by less frequent pluckings and lighter prunings, supplemented by heavy applications of lime.

A root disease of tea, probably caused by *Armillaria mellea* or *A. fuscipes*, was found on nursery plants and subsequently on mature bushes, this being the first record of its occurrence in Ceylon. The tap roots of the seedlings were found to be split from the tip to the collar, sheets of white fungus being present on the split surfaces. Fragments of rhizomorphs, apparently developing from the white mycelium on the split surfaces, were found attached to a diseased root. In pure culture the white mycelium gave rise to definite rhizomorphs, thereby supporting the view that both these organs belong to the same fungus. Deep fissures occurred on the infected roots and collars of mature bushes. The cortex was permeated with thick cords of mycelium, white internally and dark red (almost black) on the surface. The characteristic rhizomorphs were found attached to the cortex and running free through the soil. This disease also occurred in a very severe form on *Albizzia lopantha*.

Wood rot or branch canker (associated with *Ustulina zonata*, *Aglaospora aculeata*, and probably also with other organisms) [ibid., v, p. 633] has been well controlled by drastic collar-pruning, the cuts being made at or just below soil level and covered with earth after the application of tar or some other protective to the smoothed surface [ibid., iv, p. 591]. In a preliminary experiment to test the efficacy of various wound coverings, cargillineum A and B, Burgundy paste, and a solution of copper sulphate and bichromate were more or less washed off three months after application. Various tars, red oxide, and white lead paint form good covers which should withstand weathering, but further observations are necessary to determine their relative value.

A die-back of shoots was observed in the Agrapatana district in the early part of the year. *Leptothyrium theae* Petch was isolated from the diseased stems, but inoculation tests showed that this

fungus is only a weak parasite, infecting the shoots through wounds.

The spores of *Cercosporella theae* [ibid., vi, p. 582] are rarely found on infected tea leaves, but they are produced in abundance in acacias, gums [*Eucalyptus* spp.], and *Albizzia lopantha*, and the tea is infected from these sources. The use of fungicides is impracticable in the control of this disease, and in very severe cases it may be necessary to remove the alternate hosts of the fungus.

Tea bushes affected by witches' broom [loc. cit.] developed a disease of the leaves due to *Coniothyrium theae* Petch, which probably causes little harm to plants in normal health.

Rosellinia arcuata [ibid., vii, p. 543] was shown by inoculation experiments to be capable of attacking healthy tea plants. A careful examination of the dead seedlings was made for the presence of *Rhizoctonia bataticola* [*Macrophomina phaseoli*: see above, p. 701], but no trace of this fungus was found, and it is concluded that *Rosellinia arcuata* is a virulent parasite of bushes which have not previously been weakened by the attacks of other organisms.

'Bitten off' disease, characterized by the disappearance of the lateral roots and a progressive rot of the tap root, is prevalent on various types of soil. Excess of soil water appears to be an important contributory factor in the etiology of this disease, the exact cause of which is obscure.

TUNSTALL (A. C.). **Vegetable parasites of the Tea plant (continued). Blights on the stem.**—*Quart. Journ. Indian Tea Assoc., 1928*, 1, pp. 45–57, 1928.

Continuing his account of the vegetable parasites of the tea plant [*R.A.M.*, vii, p. 542], the writer gives notes on the history, symptoms, and control of some stem diseases. The causal organism of thread blight [ibid., vi, p. 2] has not been observed to penetrate the leaf tissues, but mycelium was found in the external tissues of the old stems just outside the cork layer.

Corticium invisum, the causal organism of black rot [loc. cit.], produces on the leaves irregular brown patches similar to those associated with thread blight, but no threads are visible to the naked eye. The diseased leaves remain attached to the stems and to each other by a small cushion of mycelium. The mycelium is wholly external and is confined to the green portions of the plant. Under damp conditions the fungus may develop sufficiently to become visible as a white or cream-coloured weft on the leaf surface, forming a cobwebby mass in the axils. Black rot spreads much more rapidly than thread blight, since it produces spores freely in the rainy season, these being developed on inconspicuous powdery white patches on the under surface of apparently healthy leaves.

The name *C. dealbans* has been suggested for *C.* sp. 1 [ibid., v, p. 136] on account of the whitening of the bark produced by this fungus.

Nectria cinnabarina is frequently found in Darjeeling on tea growing in the vicinity of certain trees, e. g., *Alnus nepalensis* and *Pyrularia edulis*, the flowering shoots of which are also infected by the fungus. The organism attacks the bark of woody stems and the growing layers, whence it spreads down the medullary

rays into the pith. The growing layers are not killed immediately, but the infected stems are gradually starved and often die after some months in a moribund condition. Occasionally the affected plants form callosities on the stems in an attempt to repair the damage caused by the fungus.

VALLEAU (W. D.) & JOHNSON (E. M.). **Tobacco frenching—a nitrogen deficiency disease.**—*Kentucky Agric. Exper. Stat. Res. Bull.* 281, pp. 179–253, 12 figs., 1927. [Received September, 1928.]

Frenching of tobacco [*R.A.M.*, vii, p. 680], characterized by chlorosis of the intervenal leaf tissues or even, in severe cases, of the entire growing shoot, together with the development of narrow, strap-like leaves, has been found not to be transmissible by grafting and is regarded as being wholly a nutritional disorder.

Fifty-two parts of NO_3 per million of air-dry soil added fortnightly to soil in which the plants were beginning to show signs of nitrogen starvation did not prevent frenching, but when the quantity was doubled the plants resumed their normal healthy appearance. The addition of 40 parts of NO_3 per million of dry sand failed to control the disease, but when the amount was increased to 80 parts per million the plants developed healthy green growth. Heating virgin soil to 65° C. acts similarly to the application of nitrogen in preventing the development of frenching. The addition of large quantities of CaO to virgin soil stimulated the growth of tobacco plants in some degree and apparently prevented frenching, though the lower leaves eventually developed the symptoms of nitrogen starvation.

The recovery of frenched tobacco plants may be effected in various ways, both under natural conditions in the field and by experimental treatment. In one striking case described the tips were cured by layering them in sand and supplying them with nitrogen through the roots that subsequently developed in the sand. The rooted growing points recovered, while suckers developing from the base of the plants and obtaining nitrogen only from the original soil continued to french. This is considered to show that the problem is purely one of nitrogen supply.

Evidence is presented which strongly suggests that drought spot, cork spot, and bitter pit of apples [ibid., v, pp. 147, 474; vii, p. 102] and blossom-end rot of tomatoes [ibid., v, pp. 405, 635] are diseases of the same general nature as frenching, all being due to nitrogen starvation of the affected tissues. The theory is also advanced that brown bark spot of apples and other trees [ibid., ii, p. 221] is caused by lack of available nitrogen.

VALLEAU (W. D.) & JOHNSON (E. M.). **Observations and experiments on the control of true Tobacco mosaic.**—*Kentucky Agric. Exper. Stat. Bull.* 280, pp. 145–174, 3 figs., 1927. [Received September, 1928.]

This is an expanded account of the writers' investigations in the control of tobacco mosaic in Kentucky, a preliminary notice of which has already appeared [*R.A.M.*, vii, p. 477]. It is pointed out that tomato mosaic may be caused by the tobacco mosaic virus [see

following abstracts], and that infection may be as readily transmitted to the former as to the latter host by persons chewing diseased tobacco.

Bewley (W. F.) & Corbett (W.). **'Mosaic' disease of the Tomato.**—*Thirteenth Ann. Rept. Cheshunt Exper. and Res. Stat., Hertfordshire, 1927*, pp. 51–59, 1928.

The extent of the damage caused by tomato mosaic, which is commonly present in commercial nurseries, varies considerably. Usually, however, the disease does not affect the early part of the crop, represented by the five bottom trusses. The top growth is more injured, and if the growth is 'stopped' in the usual way, weak mosaic shoots may become crippled and yield little. The severity of the disease in nurseries has been found to be increased by the presence of a high water table, especially when the underground water lies stagnant in an impervious depression.

In a series of experiments [the results of which are tabulated] a large proportion of tomato and tobacco plants (especially the latter) inoculated with expressed juice or crushed tissue of tomato aucuba mosaic material developed stripe [*R.A.M.*, iv, p. 24; vii, p. 481], the symptoms of which appeared much more rapidly than those of ordinary mosaic. The passage of the expressed juice of aucuba mosaic plants through a Pasteur-Chamberland filter candle of porosity L9 resulted in a loss of infectivity. All tomato plants inoculated with aucuba mosaic and stripe developed the former condition and only occasionally showed symptoms of the latter, whereas tobacco plants invariably developed both forms of the disease. Eggplants inoculated with aucuba mosaic showed only stripe symptoms.

Inoculation with ordinary mosaic resulted in some plants developing ordinary mosaic, others stripe, and others again a combination of the two forms. When ordinary mosaic and stripe were combined in the inoculum, a large number of the plants developed both forms of the disease; in two cases tobacco plants inoculated with the filtered expressed juice of a tomato plant infected by mosaic and stripe developed stripe alone.

The inoculation of tobacco or tomato plants with stripe alone invariably led to the development of ordinary mosaic, whereas when plants of *Datura stramonium* were used all the plants showed stripe but no mosaic. Juice from stripe plants was rendered innocuous by ten minutes' heating at a temperature of 80° to 90° C.

Smith (J. H.). **Experiments with a mosaic disease of Tomato.**—*Ann. of Appl. Biol.*, xv, 2, pp. 155–167, 1 pl., 1928.

In the experiments described in detail in this paper, the author used the virus of the aucuba mosaic disease of tomato described in 1925 by Bewley [see preceding abstract]. Although in its general characters and in the nature of the disease it produces it corresponds very closely with the virus of the usual tomato or tobacco mosaic, it differs from the latter in the much greater intensity and sharpness of the symptoms caused on the leaves [a description of which is given], differences which have been regularly maintained on tomato since the first isolation of the aucuba mosaic virus several

years ago. It is, therefore, concluded that these two viruses are distinct. On the other hand, the characters of the aucuba mosaic virus and the symptoms produced by it closely resemble those described by Johnson under the name 'yellow tobacco mosaic' (tobacco virus 6) [ibid., vi, p. 501], and it is suggested that these diseases are possibly due to the same cause.

Inoculation experiments showed that the filtered juice of infected plants remained partially infective at a dilution in water up to 1 in 10,000, while with a 1 in 100 dilution over 80 per cent. of infections were always obtained during the season of the year favourable to growth. The virus retained its activity for a year or more at room temperature in subdued light, and withstood heating for 10 minutes at 80° C., but was inactivated at 90°. It was not destroyed by 90 per cent. alcohol after one hour's contact, being carried down with the precipitate, and it was not inactivated when the formation of the precipitate was prevented by the addition of NaOH to the solution. All attempts to cultivate the virus outside the living plant gave negative results.

ROSA (J. T.). **Chemical changes accompanying western yellow blight of Tomato.**—*Plant Physiol.*, ii, pp. 163–169, 1927. [Abs. in *Chem. Abstracts*, xxii, 13, p. 2394, 1928.]

The leaves of tomatoes affected by western yellow blight [*R.A.M.*, vii, p. 478] show a decrease of total nitrogen, alcohol-insoluble nitrogen, and diastatic activity, whereas reducing sugars, sucrose, starch, and alcohol-soluble nitrogen increase progressively with the development of external symptoms of the disease. There is an accumulation of carbohydrates and an increase of total and alcohol-soluble nitrogen in the roots and stems of blighted plants. It is concluded that the blight symptoms are not directly due to nitrogen starvation, but that the inability to translocate nitrogen and synthesize higher nitrogen compounds within the plant may be closely correlated with the inception of the disease.

NEWHALL (A. G.). **The relation of humidity and ventilation to the leaf mould disease of Tomatoes.**—*Bimonthly Bull. Ohio Agric. Exper. Stat.*, xiii, 3, pp. 119–122, 1 fig., 1 diag., 1928.

Repeated experiments in the control of tomato leaf mould (*Cladosporium fulvum*) in Ohio greenhouses by the application of liquid and dry copper and sulphur fungicides have given very unsatisfactory results, the spores of the fungus showing great tolerance for both these substances [cf. *R.A.M.*, vii, pp. 479, 605]. Germination is inhibited in an atmosphere having a relative humidity below 96 per cent. at ordinary temperatures, and is best between 98 and 99 per cent. It has been observed, however, that, even at a relative humidity as low as 80 per cent., the leaves may give off enough moisture to bring the air in the immediate vicinity of the spores to a favourable point for germination, so that the disease makes normal progress. In a commercial greenhouse of 1½ acres at Poland, Ohio, the disease has been controlled by the installation of an electric fan with a capacity of 20,000 cu. ft. per minute, effecting a change of air every 22 to 32 minutes.

SMALL (T.). **Tomato leaf-mould.**—*Thirteenth Ann. Rept. Cheshunt Exper. and Res. Stat., Hertfordshire, 1927*, pp. 46–51, 1928.

Of the 200 tomato varieties tested for resistance to leaf mould (*Cladosporium fulvum*), six, namely, Stirling Castle, Up-to-Date, Norduke, Maincrop, Satisfaction, and Frogmore Selected, showed some degree of resistance. These varieties, however, produced inferior fruit, and further crossing with commercial sorts is necessary for the development of new varieties combining disease resistance with other desirable qualities. The results of inoculation experiments showed that infection progresses most rapidly during July and August at an average temperature of 74° F. combined with a high relative humidity (over 70 per cent. during the day and approaching saturation at night). Infection probably occurs at 50° to 55°, but at this low temperature the development and sporulation of the fungus are arrested, so that the symptoms are scarcely perceptible after three weeks. It appears from the author's experiments that the development of the parasite within the plant is not affected by watering.

HAYMAKER (H. H.). **Pathogenicity of two strains of the Tomato-wilt fungus, Fusarium lycopersici Sacc.**—*Journ. Agric. Res.*, xxxvi, 8, pp. 675–695, 2 figs., 5 diags., 1 graph, 1928.

The results of comparative physiological tests with two strains of the tomato wilt fungus (*Fusarium lycopersici*) representing White's dissimilar groups [*R.A.M.*, vi, p. 516] are fully described and tabulated.

The two strains showed very divergent characteristics in culture, A proving quite constant, while B was extremely variable and produced many saltants which differed from the parent form in appearance and pathogenicity. Strain A was shown to be uniformly more pathogenic than B, the difference being maintained in spite of modifications in the soil temperature, an increase of the spore concentration in the inoculum, and the use of various types of inoculum.

Both strains made the best growth on potato-dextrose agar at 28° C., which was also found to be the optimum temperature for the development of wilt in Norton and Kansas 9A seedlings. The resistance to wilt exhibited by certain varieties appears to be correlated with two factors. In the first place, the temperature range for infection may differ according to the variety. Thus, Norton was found to be more susceptible than Kansas 9A at 31°, while at 24° the position was reversed. Secondly, resistant varieties appear to possess certain physiological properties enabling them to tolerate the final attack of the pathogen notwithstanding its invasion of the host tissues. This was strikingly demonstrated in the case of Marvel, which showed only 2 per cent. of wilt as a result of 52 per cent. infection.

In view of the instability of the strains used in these trials the establishment of varieties or forms of *F. lycopersici* is considered inadvisable.

HAYMAKER (H. H.). **Relation of toxic excretory products from two strains of Fusarium lycopersici Sacc. to Tomato wilt.**—

Journ. Agric. Res., xxxvi, 8, pp. 697–719, 4 figs., 1 diag., 1928.

In a series of experiments [details of which are given] to determine the factor or factors responsible for the causation of tomato wilt by *Fusarium lycopersici*, a definite correlation was established between the pathogenicity of the fungus and the toxicity of its metabolic products.

The treatment of tomato plants in the blossoming stage with the filtrate from liquid cultures of strains A and B of *F. lycopersici* [see preceding abstract] resulted in the development of symptoms similar to those occurring on older plants in the field. Varieties resistant to the fungus itself were also more resistant to the excretory products. Similarly, the metabolic products of the more virulent strain A proved to be more generally toxic than those liberated by the comparatively innocuous strain B.

Temperature and relative humidity were found to be important factors in the development of wilt in plants exposed to the action of toxic extracts, high temperatures and low atmospheric humidity causing rapid wilting. The excretory products from cultures grown at 28° C. proved to be the most toxic.

The predisposition of the tomato to wilt at higher temperatures appears to be due to a combination of factors. In the first place, the vigour of the parasite is greatest at a range of 24° to 30°, at which temperatures the most toxic metabolic products are formed; and secondly, the unbalanced physiological conditions of the host at temperatures exceeding 30° render it more subject to the action of such products. The latter factor is probably of great significance, since temperatures of 30° to 32° are more favourable to wilt than those round 24°, notwithstanding the luxuriant growth of the fungus and the production of highly toxic materials at the latter temperature.

WILLIAMS (P. H.). **The effect of some compounds on Verticillium wilt of Tomato.**—*Thirteenth Ann. Rept. Cheshunt Exper. and Res. Stat., Hertfordshire, 1927*, pp. 38–41, 1928.

The results [which are tabulated] of a series of experiments on the control of 'sleepy disease' or wilt in tomatoes (*Verticillium albo-atrum*) [*R.A.M.*, vi, p. 434] by soil applications of various chemical compounds showed that the most promising among the substances tested are magnesium carbonate and lime in equal parts, potassium permanganate, and ferrous sulphate. The improvement observed in the condition of plants treated with potassium nitrate and ammonium sulphate appears to have been mainly due to the manurial effect of these salts.

DUFRÉNOY (J.). **Dépérissements des arbres dans le Massif Central.** [The dying-off of trees in the Central Massif.]—*Bull. Office Agric. Régional du Massif Central (Clermont-Ferrand)*, 8, pp. 101–119, 11 figs., 1927. [Received September, 1928.]

The results of the author's investigations on the dying-off of fruit trees (associated with *Verticillium ? dahliae* and *Stereum purpureum*), and on the ink disease of chestnuts (*Blepharospora* [*Phytophthora*] *cambivora*) in the Central Massif are here recapitu-

lated [*R.A.M.*, vi, p. 426; vii, p. 458]. In connexion with the first-named disease it is stated that *V. dahliae* has been isolated by the author at the New York State College of Agriculture from *Aralia racemosa*, peony, and eggplant.

Canada Department of Agriculture Destructive Insect and Pest Act Advisory Board. Regulations under the Destructive Insect and Pest Act P.C. 559. Regulation No. 1 (Foreign) 2nd Revision.—6 pp., 1928.

As from 1st September, 1928, nursery stock (including all plants for ornamental, cropping, or propagation purposes, but not seeds) can only be admitted into Canada from all countries (including the United States) subject to the following regulations. Permits for the importation of nursery stock must be obtained from the Secretary of the Destructive Insect and Pest Act Advisory Board, Department of Agriculture, Ottawa. Every consignment of nursery stock entering Canada must be accompanied by a certificate of inspection, issued and signed by the competent authorities in the country of origin at the time of packing, vouching for the freedom of the said stock from any pest or disease. Nursery stock from countries not maintaining an inspection service may be admitted under a special permit from the Board. Entry into Canada may be effected only through certain ports or points of entry, which are specified. Imported stock is subject to inspection on arrival, infected material being treated or destroyed at the inspector's discretion. Provision has been made for the importation by mail of small quantities of nursery stock, e.g., new varieties of roots, bulbs, and the like, subject to inspection at certain mail ports which are specified, if accompanied by the above-mentioned certificate of inspection in the country of origin.

Legislative and administrative measures. Belgium.—*Internat. Rev. of Plant. Protect.*, N.S., xix, 6, p. 568, 1928.

As from 28th March, 1928, the presence of wart disease (*Synchytrium endobioticum*) in growing or stored potatoes in any part of Belgium must immediately be notified to the mayor of the parish [*R.A.M.*, vii, p. 111]. Potatoes lifted on land officially declared to be infected may not be removed without previous cooking.

Legislative and administrative measures. French Protectorate of Morocco.—*Internat. Rev. of Plant Protect.*, N.S., xix, 6, p. 571, 1928.

A Decree of 20th September, 1927, regulates the phytosanitary measures in the French zone of the Sherifian Empire. The regulations are mainly concerned with importation and transit, the supervision of the health of the crops, the inspection and certification of horticultural establishments and nurseries, control of plant parasites, and the like.

IMPERIAL BUREAU OF MYCOLOGY

REVIEW

OF

APPLIED MYCOLOGY

VOL. VII DECEMBER 1928

HIRT (R. R.). **The biology of Polyporus gilvus (Schw.) Fries.**—*New York State Coll. of Forestry Bull.*, i, 1a (*Tech. Publication* 22), 47 pp., 11 pl., 1928.

Polyporus gilvus, a common wood-destroying fungus in every continent except Europe (where it appears to be rare), is stated to be widely distributed in the hardwood forests of the United States and Canada, where it attacks a large number of hosts, including oak, chestnut, ash, birch, *Hamamelis virginiana*, *Acer* spp., and cultivated varieties of plum, pear, and cherry.

The fungus is only found on living hosts when they have been subjected to natural or mechanical injuries which expose the dead sapwood, and in such cases the heartwood may also be invaded and severely rotted. A typical white rot of the wood results in both sap- and heartwood. Logs, bridge timbers, structural supports, and the like are frequently destroyed by *P. gilvus*.

Sporulation is continuous in the vicinity of Syracuse, N.Y., over varying periods in July and in the first half of August, but the spore-casting periods of a given sporophore appear to be much shorter, with a maximum of three consecutive nights for field, and of 24 for laboratory, specimens. Spores are discharged in greater numbers at night than during the day. Within limits favouring spore production, changes in temperature and moisture produced no apparent effect on periodic nocturnal sporulation.

In order to secure a constant supply of fresh sporophores for cultural studies, blocks of infected wood were collected during the summer and placed in pans containing a little water in the laboratory at 22°. Fruiting bodies generally appeared within 48 hours and spores were soon produced. Spore traps were then arranged and quantities of spores collected [cf. *R.A.M.*, v, p. 199]. Similar methods were successfully employed with *Trametes suaveolens*.

It was found that spores taken from certain traps failed to germinate under any of the conditions tested, while those from others gave practically 100 per cent. germination. Evidently some sporophores produce non-viable spores, as White (*Trans. Roy. Canadian Inst.*, [xii], p. 133, 1919) also found with *Fomes applanatus* [*Ganoderma applanatum*].

P. gilvus is homothallic, as shown by the development of viable spores from sporophores produced in monosporous cultures.

A careful study of the growth of stratified sporophores indicated that the new growth is produced from the mycelium within the wood at the base of the sporophore, and that the stratification is not indicative of perennial growth of the fruiting body itself.

A chemical analysis of decayed and normal white ash and white oak wood (*Fraxinus americana* and *Quercus alba*) showed that delignification occurs only in those elements where lignin is apparently present in small quantities. The highly lignified elements remain in an extreme state of decay with no perceptible disintegration of the walls, except for the large number of perforations marking the passage of the hyphae. Thus the chemical change expressed by the bleaching of the fibres consists mainly in the destruction of the cellulose structures of the cell walls.

Though the fungus is often found attacking living trees it is not, strictly speaking, a true parasite, as it usually grows only in tissues containing dead elements. It is, however, capable of penetrating living tyloses and cannot, therefore, be regarded as a pure saprophyte.

The taxonomy of *P. gilvus* is discussed and a bibliography of 53 titles is appended.

WAGENER (W. W.). **Coryneum canker of Cypress.**—*Science*, N.S., lxvii, 1745, p. 584, 1928.

Monterey cypresses (*Cupressus macrocarpa*) in the San Francisco Bay region of California have recently begun to suffer from bark cankers, isolations from which yielded an apparently undescribed species of *Coryneum*. The affected trees are conspicuous by the gradual dying of individual parts of the crown due to the girdling action of the cankers. This process is accompanied by a heavy resin flow, the occurrence of which is one of the most characteristic symptoms of the disease. Inoculation experiments with the above-mentioned fungus gave positive results both on wounded and unwounded young bark and on unwounded foliage, typical acervuli developing from a number of the infections. The excision of all cankers and the application of a standard fungicide are recommended as control measures. In addition to *C. macrocarpa*, the Italian cypress (*C. sempervirens*) is also susceptible to the disease.

BATEMAN (E.). **Factors to be considered in the testing of preservatives.**—*Proc. Amer. Wood Preservers' Assoc., 1928*, pp. 35–42, 1928.

The requirements of a wood preservative are stated to be as follows: toxicity towards parasitic organisms; absence of harmful action on wood or steel; facility of injection into wood; some degree of permanence; and availability in relatively large quantities at a reasonable cost.

Petroleum oil is cheap, fairly permanent, readily injected, and non-injurious to steel and wood, but it is not sufficiently toxic to be a valuable timber preservative under ordinary conditions. Benzene and mercuric chloride each satisfy most of the above requirements, but the former possesses a very low degree of permanence, while the latter attacks steel severely. Cadmium sulphate is eminently satisfactory in all respects except for its prohibitive price.

Permanence involves both chemical and physical stability [*R.A.M.*, vi, p. 708]. Some inorganic salts are easily changed by oxidation, e. g., ferrous into ferric salts, which may affect their toxic value or solubility. Other inorganic compounds, such as zinc chloride, lose some of their toxicity through the action of alternate wetting and drying. Organic compounds may be affected either by oxidation or by polymerization : the former process certainly reduces their toxicity and the latter may do so under certain conditions.

Leaching, evaporation, and mechanical washing are physical causes of impermanence. The liquid may move after injection into the wood as free liquid, as vapour, and by movement in the cell walls. Theoretically it is known that the rate of evaporation of any material is proportional to its vapour pressure. Practically it has been shown that the loss of creosote from open tanks, for instance, is a logarithmic function of the amount of oil distilling below 270° C. With inorganic salts evaporation can generally be excluded as a cause of impermanence, which must be due, therefore, either to the movement of free water or to that of the salt by diffusion through the bound water.

REEVE (C. S.). **The determination of the toxicity of wood preservatives.**—*Proc. Amer. Wood Preservers' Assoc., 1928*, pp. 42–52, 1 graph, 1928.

After a brief discussion of the methods proposed by various investigators for determining the relative toxicity of wood preservatives, the writer describes a method which has proved useful in laboratory tests on the toxicity of various preparations towards *Fomes annosus* on white pine [*Pinus strobus*] and *Polystictus hirsutus* on yellow poplar [*Liriodendron tulipifera*].

The oil to be tested is first dissolved in C.P. benzol, the solution being prepared in such concentration that 15 to 30 c.c. will introduce the desired percentage of preservative when mixed with 10 gm. of sawdust. The impregnated sawdust is spread out and dried at room temperature for 24 hours, divided into two portions, and thoroughly mixed with water (16 c.c. for white pine and 12 c.c. for yellow poplar). The wetted sawdust is then spread over a Petri dish and sterilized. The dishes are inoculated with agar cultures of the test fungi and incubated at 28° to 30° C. The toxic point is determined as the lowest concentration at which no growth occurs after a period of 28 days.

In general, *F. annosus* proved more resistant than *P. hirsutus* to the preservatives tested ; the best results against it were obtained with crude tar acids and the least satisfactory with carbolic oil and the coal-tar and water gas tar distillates. Beta naphthol and zinc chloride proved highly efficacious in inhibiting growth of *P. hirsutus*, which was also checked by treatment with coal-tar distillate.

The results of fractionation tests with coal-tar distillates and solutions (with or without acids and tar bases) showed that the most toxic material for both fungi is concentrated in the oils boiling between 280° and 320°.

Howe (P. J.). **Weathering and field tests on treated wood.**—*Proc. Amer. Wood Preservers' Assoc., 1928*, pp. 192–209, 4 figs., 2 graphs, 1928.

In view of the excellent results obtained with zinc meta-arsenite and copper arsenite in weathering tests on southern yellow pine [*Pinus palustris*] wood, exposed to infection by *Fomes annosus* [*R.A.M.*, vii, p. 484], the writer carried out a further series of trials to determine the toxicity of the first-named substance towards a number of other wood-destroying fungi. Used at a concentration of 0·4 per cent., $Zn(AsO_2)_2$ completely inhibited the growth of *Polyporus anceps*, *P. schweinitzii*, *P. betulinus*, *P. sulphureus*, *Poria incrassata*, *P. subacida*, *Stereum subpileatum*, *Trametes pini*, *Polystictus versicolor*, *Coniophora cerebella*, *Merulius lacrymans*, *Daedalea quercina*, and *Lenzites trabea*.

Chupp (C.). **Combating diseases of vegetables.**—*Cornell Agric. Exper. Stat. Extens. Bull.* 171, 27 pp., 1 fig., 1928.

Directions are given in popular terms for the control of some important vegetable diseases by cultural measures, seed and seed-bed treatment, and spraying or dusting. A key showing the application of the various methods to the different crops is appended.

Clayton (E. E.). **Increasing stands from vegetable seeds by seed treatment.**—*New York (Geneva) Agric. Exper. Stat. Bull.* 554, 16 pp., 2 pl., 1928.

In the experiments briefly outlined in this bulletin, supposedly healthy seeds of cabbage, lettuce, radish, spinach, peas, maize, cucumbers, tomatoes, and string beans [*Phaseolus vulgaris*] were treated with organic mercury preparations, including Bayer dipdust [*R.A.M.*, vii, p. 666], uspulun, and semesan in liquid and dust form, and were then sown, simultaneously with controls, at intervals, from early spring to midsummer both in the greenhouse and in the field. All the treated seeds sown early in the spring consistently produced considerably increased stands as compared with the controls, apparently owing to the protection afforded by the treatment against decay of the seed in the soil during this period, when germination is slow. Later in the season, when the soil was warm and germination much more rapid, the benefit derived from treatment was hardly noticeable. In a limited number of cases the plants raised from treated seed gave increases in yield greater than might have been expected from the gains in germination only, and this is thought to indicate a possible stimulatory effect.

In the greenhouse, seed treatment greatly increased the stands from seed sown in midwinter, but in late spring the difference between treated and untreated seeds was very small.

Preston (N. C.). **Experiments on the control of finger and toe in Cabbages by the use of mercuric chloride and other substances.**—*Welsh Journ. of Agric.*, iv, pp. 280–295, 1 fig., 1928.

The author describes a series of field experiments extending over the years 1925–27 on the control of finger-and-toe disease of cabbage

and cauliflower (*Plasmodiophora brassicae*) [*R.A.M.*, vi, p. 655]. The seedlings were set in uniformly heavily infected soil and 'puddled in' with about half a pint of a solution of one of various disinfectants. Of the substances tried methyl green, malachite green, methyl violet, and brilliant green, at concentrations up to 0·02 per cent. were ineffective, whilst Cheshunt compound, clubicide, commercial formalin 0·5 and 0·2 per cent., and lysol 0·2 per cent. also proved unsatisfactory. The best control was consistently given by a 0·1 per cent. solution of mercuric chloride [ibid., vi, p. 387]. This treatment reduced the clubbing from 97 per cent. badly and moderately clubbed in the control to 66 per cent. in 1925; from 94 to 23 per cent. in 1926; and from 67 to 39 per cent. in 1927. A second application in 1927 reduced the corresponding infection in two plots from 70 and 50 to 28 and 32 per cent., respectively. Uspulun (0·5 per cent.) proved rather less effective than mercuric chloride. The exceptionally good results obtained in 1926 are attributed to the dry weather experienced immediately after planting time.

In 1927, extended trials with mercuric chloride on cabbage seedlings were conducted in eleven different localities, including several where the disease was very prevalent. At some centres the treatment temporarily checked the growth of the plants, which in one case failed to recover completely. At five centres plants receiving one application of the mercuric chloride averaged 12·1 per cent. badly and moderately infected, and the untreated 60·5 per cent.; the figures from 3 centres for two applications were 0·7 and 74·4 per cent., respectively, whilst at one centre 3 applications gave 0 and 78 per cent., respectively. At all the centres the treatment exercised a consistently favourable effect upon the root system of the plants.

Under the experimental conditions the cost of the treatment amounted to 6*d*. or 7*d*. per 100 plants, or less than 3 per cent. of the average value of the crop.

KÖHNE. **Kohlhernie-Bekämpfung mit Uspulun.** [Control of club-root of Cabbage with uspulun.]—*Nachricht. über Schädlingsbekämpf.*, iii, 2, pp. 61–65, 1928.

Complete control of club-root [*Plasmodiophora brassicae*] of cabbage and rape [*Brassica napus*] was given by the admixture with the soil of uspulun at the rate of 70 gm. per sq. m. [*R.A.M.*, vi, pp. 329, 655]. The immersion of the roots, previous to planting, in a mixture of water, clay, and cow-dung with the addition of 2·5 gm. uspulun, also led to a substantial reduction of infection (from 40 to 10 per cent.). The disinfection of the seed-beds should be completed at least a fortnight before planting, as otherwise serious injury to the stand may result.

DAVIES (D. W.), GRIFFITH (M.), & EVANS (G.). **'Finger and toe' experiments in mid-Wales involving the use of resistant varieties of Swedes.**—*Welsh Journ. of Agric.*, iv, pp. 295–303, 1928.

Further trials conducted in Wales from 1924–27 of the relative resistance of certain varieties of swedes to finger-and-toe disease

(*Plasmodiophora brassicae*) [*R.A.M.*, iv, p. 460] showed that the Danish varieties Bangholm Hernig, Bangholm Studsgaard, and Wilhelmsburger Østofte were more resistant and gave a substantially higher yield on heavily infected soil than the British varieties Best of All, Lord Derby, and Elephant, though these gave the heavier yield on uncontaminated land. The Danish swedes were also resistant to frost and mildew [*Erysiphe polygoni*].

CLAYTON (E. E.). **Seed treatment for black-leg disease of crucifers.** —*New York (Geneva) Agric. Exper. Stat. Tech. Bull.* 137, 58 pp., 5 pl., 1928.

In greenhouse and field experiments [details of which are given] made in the period from 1922 to 1927, inclusive, on Long Island in the control of blackleg of cabbage and Brussels sprouts (*Phoma lingam*) [*R.A.M.*, vii, p. 610] by various methods of seed disinfection, the best results were obtained by hot water treatment at temperatures of 50°, 55°, or 60° C. for 25, 10, or $4\frac{1}{2}$ minutes, respectively; preference is given, however, to the 25 minutes' treatment at 50°, as it affords a greater margin of safety and is less liable to injure the germinability of the seed. It is pointed out that, while in the tests which were made with heavily infected seeds from artificially inoculated pods absolute control of the disease was not attained by any of the hot water treatments used, three years of field work, during which commercial stocks of seed were treated for a large number of growers, showed that the treatment recommended was practically 100 per cent. effective in eliminating blackleg and often exercised a favourable influence on the subsequent growth of the plants. It was further shown that the treatment did not appreciably reduce the germination of vigorous seed, provided the latter was sown not more than three or four months after treatment. The author considers it advisable, however, that the hot water treatment should not be made by individual growers but rather should be done under competent supervision, such as that of a central treating station, where adequate tests can be made of the viability of the seed before treatment.

None of the chemical dust or liquid disinfectants tested, including semesan, semesan jr., copper carbonate, and Bayer dusts, and mercuric chloride, semesan, uspulun, and germisan solutions, can be recommended for use against blackleg in the light of the experiments. Germisan at 0·25 per cent. for two hours was very effective, but was also very liable to injure the seed, while shorter treatments were ineffective. Uspulun at the same concentration was safe, but little, if at all, more effective than the standard mercuric chloride treatment, and the latter was not satisfactory except in cases of moderate to light infection.

MURPHY (P. A.). **The connexion between dry-rot of Swedes in New Zealand and British seed.**—*Nature*, cxxii, 3062, pp. 13–14, 1928.

The author has made a critical study of some of Cunningham's strains of *Phoma lingam*, the causal organism of dry rot of swedes and turnips in New Zealand [*R.A.M.*, vii, p. 72]. Contrary to expectation, several of these show no *Phoma* stage, but

produce spore forms referable to the Moniliales and Ascomycetes. Thus 473 (I A) appears, from its conidiophores and conidia, to be a *Macrosporium* differing from the ordinary *Alternaria* on swede seed-coats. This fungus also produces an abundance of sterile enclosed fruit bodies, which an examination of the same organism isolated from Irish material showed to be immature perithecia. A comparative examination of the New Zealand 473 (I A) and the Irish fungus on six different media showed that these organisms are identical in morphological and cultural characters (including saltation). The perithecia produced (in addition to the *Macrosporium* conidia) by the Irish fungus occasionally contained asci and muriform ascospores of the *Pleospora* type. Both the organisms in question have been grown from a single conidium, while the Irish fungus was also grown from a single ascus and a single ascospore, with identical results in every case. No trace of pycnidia was found. Ascospores have not yet been observed in 473 (I A) but it is believed that they will develop in time.

Similar conclusions have been reached concerning some of the other New Zealand strains referred to *P. lingam*. Thus 488 (I B) is a species of *Alternaria*, 505 (I B) is doubtful, while 503 and 533 (I A) appear to be a species of *Phoma*. The cultures representing group II, 491 B and 596 (II A) closely resemble isolations of *Phoma* made from rotting roots in Ireland.

The importance of these results lies in their bearing on the export of British swede seed to New Zealand. If, as would appear from Cunningham's paper [loc. cit.], the parasite typical of English seed is represented by his culture 473 (I A), then this fungus, as shown above, is almost certainly not a *Phoma*, and is in no case identical with *P. lingam*. It is not uncommon as a weak parasite on English and Irish seed, while no true *Phoma* has so far been found on the 3,500 seeds of seven different samples examined.

THOMPSON (J. K.). **Diseases of Sugar Beet.**—*Brit. Beet Grower*, i, 10, pp. 277–280, 1928.

Popular notes are given on various fungous diseases and insect pests of the beet crop in the district of Holland (Lincolnshire). Downy mildew (*Peronospora schachtii*) is of regular occurrence, but so far has caused no severe damage. Rust (*Uromycès betae*), was very prevalent in 1926, more than thirty varieties cultivated at the Kirton Agricultural Institute being equally susceptible. Mosaic was also widespread during 1926. Other diseases of slight importance are leaf brown [*Sporodesmium putrefaciens*] and the production of large, warty growths on the sides of the roots [*Bacterium tumefaciens*].

KRÜGER (W.) & WIMMER (G.). **Ueber nicht parasitäre Krankheiten der Zuckerrübe.** [On non-parasitic diseases of the Sugar Beet.]—*Mitt. Anhalt. Versuchsstat. Bernburg* 65, pp. 195–289, 63 col. pl., 50 figs., 1927. [Received September, 1928.]

Full particulars are given of a number of non-parasitic diseases of sugar-beets induced by faulty nutrition, together with comparative observations on analogous conditions in other crops. Heart

and dry rot, attributed by various writers to *Phoma betae* [*R.A.M.*, vi, p. 648; vii, pp. 132, 613], is considered to be primarily due to an excessively alkaline reaction of the soil.

WILSON (J. D.). **Celery dusting in 1927.**—*Bimonthly Bull. Ohio Agric. Exper. Stat.*, xiii, 3, pp. 122–124, 1928.

In a series of experiments in the control of early and late blight of celery (*Cercospora apii* and *Septoria apii*) in northern Ohio during 1927, freshly-mixed copper-lime dusts (with or without the admixture of kaolin or infusorial earth) were found to be slightly more effective than the standard commercial brands. Any reliable preparation, however, should give adequate control if applied under suitable conditions, i. e., at regular intervals and in the early morning when the leaves are moist with dew [*R.A.M.*, vi, p. 10; vii, p. 141, and next abstract].

COONS (G. H.), NELSON (R.), & WALKER (E. A.). **Celery blight control measures compared. Dusting and spraying tested in Kalamazoo experiments.**—*Quart. Bull. Michigan Agric. Exper. Stat.*, x, 4, pp. 172–175, 1928.

Copper sulphate-lime dust (20–80), mixed by means of a special device in the machine, an already mixed commercial copper sulphate-lime dust (15–80), and Bordeaux mixture (5–5–50) were compared for their respective efficacy in the control of late blight of celery (*Septoria apii*) [see last abstract]. The dusts were applied with a horse-drawn duster. The disease did not develop until the middle of September owing to the exceptionally dry season. All three methods gave good control, the dusts being fully as effective as the standard Bordeaux mixture.

PORTER (D. R.). **Infection studies with Watermelon wilt caused by Fusarium niveum EFS.**—*Iowa Agric. Exper. Stat. Res. Bull.* 112, pp. 346–368, 7 figs., 2 graphs, 1928.

This is an expanded account of the author's studies on watermelon wilt (*Fusarium niveum*), a preliminary notice of which has already appeared [*R.A.M.*, vii, p. 422]. The disease is stated to be apparently of long standing in Iowa, where the area under watermelons has decreased from 8,000 acres in 1900 to 641 in 1926. There has been a steady decline in production, largely owing to wilt, since 1915. In 1924 and 1926 the car-lot shipments from the three chief watermelon-growing counties of Iowa were only 14 and 5 per cent., respectively, of those from the same region in 1921.

LEHMAN (S. G.). **Frog-eye leaf spot of Soy Bean caused by Cercospora diazu Miura.**—*Journ. Agric. Res.*, xxxvi, 9, pp. 811–833, 9 figs., 1 map, 1928.

Frog-eye leaf spot of soy-beans (*Cercospora diazu*) [*R.A.M.*, vi, p. 74] was first definitely identified in America in 1925, but a similar disease reported in South Carolina in 1924 was probably due to the same fungus. It is now known to occur in five of the southern States. In North Carolina it is widely distributed,

frequently affecting 25 per cent. or more of the total leaf area, especially on late maturing varieties such as Otootan and Biloxi.

The most conspicuous symptom is the presence on the leaves of rounded or angular, necrotic, reddish-brown spots, later turning light brown to ashen-grey or white in the centre. On the stems the younger lesions have red centres bordered by a black zone, while in older ones the pale smoke-grey centres are surrounded by a narrow band of red with an outer margin of black.

Successful inoculation experiments were carried out with conidia from pure cultures (a small proportion of which were still viable 94 days after collection).

C. diazu, originally described by Miura from south Manchuria in 1918 (English abstract in *Japanese Journ. of Botany*, i, p. (9), 1922), is characterized by pale sooty-coloured, generally non-septate conidiophores, measuring 100 to 130 by 5 μ, and by hyaline, cylindrical or fusiform, 0 to 6-septate, acrogenous conidia, 39 to 70 by 5 to 7 μ. The fungus isolated from American material differs in a few minor respects from the Japanese type, but the variations are not considered sufficient to separate the two forms as distinct species.

The fungus injures the host by means of some substance acting in advance of the hyphae. Alterations in the staining reaction of the host cells are succeeded by protoplasmic disorganization and complete collapse of the affected tissues, only fragments of the cellulose walls remaining in the older portions of the lesions.

On potato-dextrose agar the fungus forms colonies with prominent radial folds and less conspicuous circular convolutions, accompanied by concentric colour bands of white, olive-green, olive-brown, and grey. Growth occurs over a range of acidity extending from P_H 2·6 to 9·6 or beyond.

C. diazu is believed to overwinter on diseased leaves and stems and on seed from infected crops. Control measures should include ploughing under to promote the early decay of infective material, rotation of two or more years, and the use of early maturing varieties such as Dixie, Manchu, and Virginia, in place of the susceptible late ones.

MOREAU (L.) & VINET (E.). **Le mildiou. Evolution et traitements en 1927. Conclusions pratiques.** [Mildew. Developments and treatments in 1927. Practical conclusions.]—*Rev. de Vitic.*, lxviii, 1764, pp. 255–258; 1765, pp. 269–274; 1766, pp. 285–287, 1928.

During the exceptionally severe attacks of vine mildew [*Plasmopara viticola*: *R.A.M.*, vii, p. 489] in 1927 the authors' experimental vineyard in Anjou was given a preliminary application of 2 per cent. alkaline Bordeaux mixture and lead arsenate (1 kg. per hectol.) on 10th May. On 23rd May and 2nd or 3rd June some of the plots were given preventive treatments of 2 per cent. Bordeaux mixture (2 per cent. copper sulphate with 2 per cent. quicklime), while others received a weaker mixture (0·6 per cent. copper sulphate with 3·75 per cent. sifted lime having a lime content of 64 per cent.), the latter being used either plain, or with an adhesive, or with Villedieu's special plaster [ibid., vi, p. 654], and both containing 1 per

cent. of lead arsenate. Similar applications, but without lead arsenate, were repeated on 15th June (mildew having been observed for the first time on 11th June), and on 7th and 27th July. One plot was dusted with precipitated black cupric sulphur on 23rd May, 3rd, 15th, 30th June, 7th and 30th July; on 17th August the whole vineyard was dusted with cupric sulphur, flowers of sulphur, and sifted lime mixed in equal proportions.

The results obtained are tabulated and discussed in detail. They show that the Bordeaux mixture gave approximately the same degree of control at the two strengths used, but that the addition of adhesive or Villedieu's plaster to the weaker solution only served to reduce its efficiency. The cupric sulphur dust gave no adequate control of *P. viticola* on the leaves, but was as effective in protecting the fruit from grey rot [*Botrytis cinerea*] as the Bordeaux mixture and gave the best results of any treatment against brown rot [due to the attack of *P. viticola* on the fruit], which is regarded as the most difficult form of vine mildew to cope with. The total loss from grey rot and mildew on the Gamay vines is estimated at 93 per cent. in the controls and from 56 to 75 per cent. in the variously treated plots. Of this about 70 per cent. was due to *Botrytis* in the controls and 10 to 20 per cent. in the treated plots, whereas brown rot accounted for 23 and 46 to 55 per cent. diminution in the yield in the controls and treated plots, respectively.

The authors conclude that within the limits of 0·6 and 2 per cent. the amount of copper in the mixtures did not appreciably affect their efficacy; successful control depends very largely upon the timeliness and thoroughness of the applications. The preliminary and the two preventive applications (to which much importance is attached) were so effective against *B. cinerea* that had bad weather not persisted after 4th July the loss would have been negligible in the treated plots, though at that date nearly 50 per cent. of the crop in the controls had already been destroyed.

When brown rot prevails, dust applications should form the main part of the treatment from July onwards.

RAVAZ (L.) & VERGE (G.). **L'excoriose.** [Excoriosis.]—*Prog. Agric. et Vitic.*, lxxxix, 17, pp. 405–407; 19, pp. 450–458; 20, pp. 475–480, 2 col. pl., 9 figs., 1928.

In this popular account of the excoriosis disease of the vine caused by *Phoma flaccida* the authors expand the information contained in their former paper [*R.A.M.*, iv, p. 524], and state that in recent years the disease has shown a tendency to spread considerably in certain vineyards in the south-west and south of France, and to cause considerable injury to the framework of the vines. As regards the geographical distribution of the fungus, it is stated to have been recorded in south Russia [ibid., vi, p. 207] and in north Africa [ibid., v, p. 145], but not in America, a fact which would indicate that it is of European origin. Besides the control measures already recommended, a certain amount of protection may be obtained by spraying the vines at the beginning of vegetative growth, when the new shoots are 3 or 4 cm. long, with a concentrated Bordeaux mixture, such as the 4–4–100 formula.

BÈNES (G.). **Le court noué.** [Court noué.]—*Prog. Agric. et Vitic.*, lxxxix, 22, pp. 524–529, 1928.

The author—who claims to be a vine grower of long standing—states that numerous observations made in his own vineyard and in many other localities in the south-west and south of France lead him to consider that court noué of the vine [*R.A.M.*, vii, p. 425] is a physiological trouble brought about by the gradual decalcification of the soil in the old vineyards, with a resultant increase in the acidity of the soil. In support of this view he points out that even the varieties of vine most susceptible to court noué have never yet been found to suffer from this trouble in soils with a high lime content such as predispose the young plants to chlorosis, and that the latter disease tends to decrease in severity as the age of the vineyard increases, an indication that long-continued cultivation, manuring, and the like lead to decalcification. Other contributory factors to the development of court noué are periodical flooding of certain vineyards, which washes out the free calcium in the soil, and too deep cultivation in established vineyards, which brings the subsoil, generally deficient in lime, to the surface, and also destroys the superficial rootlets of the vines. As control measures he advises the planting in soils subject to court noué of varieties of vine with a superficial root system, the avoidance of root injuries during cultivation, and the use of stable manure in preference to artificial fertilizers, as the latter tend to render insoluble the free calcium and thus to increase the acidity of the soil.

KVASHNINA (Mme E. S.). Предварительное сообщение об обследовании болезней лекарственных и технических культур на Сев. Кавказе. [Preliminary report of the survey of diseases of medicinal and industrial plants in North Caucasus.]—*Bull. North Caucasian Plant Prot. Stat., 1928*, 4, pp. 30–46, 1 pl., 1928. [German summary.]

In this preliminary list of diseases of medicinal and industrial plants recorded in 1927 in the North Caucasus, brief descriptions are given of 48 species (of which three are new) of parasitic fungi arranged by their hosts, among which the following are of interest. *Macrosporium abutilonis* forms brownish, rounded or irregular spots, 3 to 11 mm. in diameter, on the leaves of the fibre-yielding plant *Abutilon avicinnae*; the spots are frequently confluent and occasionally bear a velvety, olive-black efflorescence. *Ascochyta gossypii* Woronichine causes on cotton leaves rounded or angular, light brown spots, from 1·5 to 4·5 mm. in diameter; on aging, the spots become whitish and fall out. [According to the description given in Jaczewsky's *Key to Imperfect Fungi*, Leningrad, ii, p. 757, 1917, the spots are from 4 to 10 mm. in diameter and are surrounded by a dark, almost black, margin. The pycnidia on the upper surface of the leaves are 110 to 180 μ in diameter; the stylospores are cylindrical, sometimes irregular, and measure 7 to 9 by 2·5 to 3 μ.] *Alternaria* sp. forms on cotton leaves reddish-brown, irregular, later confluent spots; the conidiophores are in tufts, dark brown, straight, somewhat swollen at the apex, and 12 to 88 by 4 to 5·2 μ in diameter; the conidia are in short chains, and vary in shape; they measure from 15 to 104 by 5·2 to 17·2 μ (usually 48 to 66 by

9·2 to 14 μ) and have 2 to 11 (usually 5 to 8) transverse and 1 to 3 longitudinal septa. *Bacterium malvacearum* attacks cotton, and is locally known as bacterial rust. *Ascochyta* sp. forms on both sides of the leaves of *Hibiscus cannabinus* light greyish-brown, rounded spots, from 2 to 10 mm. in diameter. On their upper surface are numerous light brown pycnidia from 80 to 116 μ in diameter; the spores are cylindrical, sometimes bent, rounded at both ends, hyaline, uniseptate, and 4·9 to 9·2 by 2 to 3·3 μ. On the same host also occur *Phoma labilis* var. *peduncularis* attacking the stems, and a species of *Fusarium* which causes a crown rot; the sporodochia of the latter consist of short, hyaline, densely aggregated conidiophores which abstrict spindle-shaped, curved, hyaline conidia, from 32 to 68 by 4 to 6 μ in diameter and with 3 to 9 (usually 3 to 5) septa. *Phyllosticta* sp. forms on the upper side of the leaves of *Arachis hypogaea* diffuse, pinkish-brown spots with a brownish margin, bearing dispersed, brown pycnidia, 24 to 164 μ in diameter. The spores are hyaline, long-ellipsoid or long-ovoid, with rounded ends, straight or slightly curved, and 4 to 8 by 1·2 to 4·2 μ. Soybeans (*Glycine hispida*) suffered severely from two undetermined bacterioses, one of the leaves and the other of the leaves and fruits; the latter is locally termed bacterial scorch. *Alternaria* sp. forms on the upper surface of the leaves of *Sesamum orientale* rounded or irregular, frequently confluent, brown spots, paling towards the margins and measuring 1·5 to 5 mm. The conidiophores are olive-brown, 1- to 4-septate, and 26 to 48 by 4·4 to 5·2 μ; the spores vary in shape from flask-shaped with a very short beak to clavate with a very long beak (5 to 6 times the length of the spore itself); they are olive-brown, with 1 to 14 transverse and 1 to 4 longitudinal septa, and measure 28 to 362 (including the beak) by 5·2 to 24 μ. *Leveillula* [*Oidiopsis*] *taurica* f. *carthami* occurs on *Carthamus tinctorius*, as does also *Cercosporina carthami*, which forms on the upper side of the leaves reddish-brown, rounded spots from 5 to 13 mm. in diameter, and *Ascochyta* sp. producing on the upper side of the leaves dispersed, brown pycnidia, from 76 to 224 μ in diameter, and containing cylindrical spores, with broadly rounded ends, sometimes slightly bent, continuous or with one indistinct septum, hyaline, and from 4·8 to 10·8 by 2·5 to 4 μ in diameter. *Cercospora atropae* sp. nov. forms on both sides of the leaves of *Atropa belladonna* rounded or angular, brown (later light coffee-coloured) spots with a narrow chestnut-coloured margin, from 1·5 to 4·5 mm. in diameter. The conidiophores are tufted, nodose, olive-brown, and measure 26 to 99 (usually 30 to 48) by 4 to 6·6 μ. The conidia are clavate-cylindrical, broadly rounded at the base, gradually tapering to the apex, with 2 to 26 (usually 7 to 11) septa, hyaline, and 28 to 208 (usually 56 to 116) by 2·8 to 4·15 μ in diameter. *Macrosporium cookei* on *Datura* spp. forms fairly large, irregular, yellowish-brown spots on the upper side of the leaves. *Cercospora levistici* sp. nov. on *Levisticum officinale* forms on both sides of the leaves rounded or irregular, dark coffee-coloured spots, 1·5 to 4 mm. in diameter. The conidiophores are tufted, straight, nodose, olive-brown, continuous or 1- to 3-septate, and 24 to 92 (usually 56 to 64) by 3·3 to 6·4 μ in diameter. The conidia are clavate-cylindrical, pointed at the apex, hyaline, with 3 to 14 (usually 6 to 10) septa, and measure

44 to 172 (usually 89 to 128) by 2·8 to 4·9 μ. *Septoria levistici* forms on the upper sides of the leaves of the same host rounded-angular, somewhat depressed, small spots with a dark margin. *Sclerotinia* sp. forms on the upper portion of the stems of *Ricinus communis* loose, white wefts of mycelium bearing isolated or aggregated, greyish-black, globose or elongated sclerotia, 4 to 13 by 3·5 to 5 mm. in diameter. On the same host also occur *Fusarium ricini*, which causes a rot of the inflorescences, and *Macrosporium cavarae*, which forms on the cotyledons and later on the lowest one or two pairs of leaves brownish spots occasionally spreading over the whole surface. On *Valeriana officinalis* were recorded *Ascochyta valerianae* (also on *V. stolonifera*) forming rounded or irregular, yellowish-brown spots on the leaves, and *Colletotrichum valerianae* sp. nov. The latter forms on the leaves amphigenous, rounded or angular, brown spots with a narrow darker margin, 2 to 4 mm. in diameter. The acervuli are epiphyllous, rounded, 40 to 60 μ in diameter, and occasionally bear at the edge dark red-brown tapering setae. The spores are hyaline, oblong, with pointed ends, and 9·9 to 24·9 by 2·3 to 4·8 μ in diameter.

Tobacco, which is stated to be a crop recently introduced in North Caucasus, was found to be attacked, among other fungi, by *Moniliopsis aderholdi*, which caused a severe seedling blight in glasshouses; *Phyllosticta tabaci*, causing on the leaves numerous rounded, yellowish-brown spots; *Alternaria tenuis*, causing on the leaves angular or rounded, brownish spots bearing a dark olive-coloured efflorescence; and also by the disease known in Russia under the name 'ryaboukha' [pox or speckled disease; *R.A.M.*, vii, p. 549]. The author believes the latter to be a physiological trouble.

BAUDYŠ (E.). **Mikromycety, které se letos vyskytují škodlivě.** [Micromycetes causing damage this year.]—*Mykologia*, Prague, iii, 7–8, pp. 86–89, 2 figs., 1926. [French summary. Received September, 1928.]

Brief notes are given on the following fungal diseases of cultivated plants which were found to be prevalent in 1926 in Czecho-Slovakia. *Gnomonia veneta* severely attacked plane trees [*Platanus* spp.] in many localities of Moravia. In the neighbourhood of Brno [Brünn] oaks were severely attacked by *Gloeosporium umbrinellum* Berk. et Br.; the fungus causes irregular, angular, brown spots on the leaves, which are prematurely killed and drop. *Gloeosporium tiliae* [*R.A.M.*, v, p. 146] was found in large numbers on lime trees over the whole of Moravia and Silesia, causing severe defoliation and occasionally killing the young shoots. In nurseries the fungus may be controlled by spraying the young trees with 1 per cent. Bordeaux mixture. Aspens in some localities were attacked by *Fusicladium radiosum*, the conidial stage of *Venturia tremulae* [ibid., v, p. 525]. In greenhouses cucumbers suffered severely from attacks of *Colletotrichum lagenarium*, and dahlias (*Dahlia variabilis*) from *Entyloma dahliae* [ibid., vi, p. 97], a new record for Czecho-Slovakia; in association with this last fungus the author also found *Cercospora grandissima* Rangel, a species described from Brazil.

McDonald (J.). **Annual Report of the Mycologist for 1927.**—*Ann. Rept. Dept. of Agric. Kenya for the year ended 31st December, 1927*, pp. 225–230, 1928.

Black tip disease of coffee [*R.A.M.*, v, p. 299] is believed to be induced by the abrupt alternations of showery and sunny weather occurring during the period of rapid growth of the trees. The trouble appears to be almost entirely absent where shading is properly carried out.

Apparently healthy coffee berries on a farm at Ngong showed discoloured spots on the beans when pulped. Numerous fungi and bacteria, apparently of a saprophytic character, were isolated from the affected material.

Sisal [*Agave rigida* var. *sisalana*] leaves affected by a pale green to brown or black discoloration near the apex showed the presence of *Colletotrichum agaves* in the diseased tissues [ibid., vi, p. 602], but the fungus is thought to be only of secondary importance in the causation of the symptoms, which may be largely attributable to excessive heat.

Artificial inoculations with a species of *Fusarium* isolated from rotting potato tubers awaiting export at Mombasa resulted in the development of a condition somewhat resembling that known as hollow heart in America [ibid., vi, p. 688], and believed to be due to overheating and insufficient ventilation in transit.

The following are new records for Kenya: powdery scab of potatoes (*Spongospora scabies*) [*S. subterranea*]; pink disease (*Corticium salmonicolor*) of loquat [*Eriobotrya japonica*] and *Cupressus macrocarpa* branches, root disease of *Acacia melanoxylon* caused by a species of *Rhizoctonia*, probably *R. lamellifera* [*R. bataticola*: ibid., v, p. 451; vii, p. 678]; loose smut of sorghum (*Sphacelotheca cruenta*); rust of *Crotalaria agatiflora* (*Aecidium crotalariae*); and rust of *Gladiolus* sp. (*Uromyces transversalis*).

Report of the Director, Purdue Agricultural Experiment Station, Lafayette, Indiana, for the year ending June 30, 1927.—75 pp., 23 figs., 1 graph, 1928.

This report contains the following scattered references of phytopathological interest other than those already noticed from different sources. In extensive studies of rust resistance in cereals [*R.A.M.*, vi, p. 660], the resistance of wheat [to *Puccinia triticina*], maize [to *P. maydis*], and barley [to *P. simplex*] was found in many varieties to depend on a single Mendelian factor. Resistance in wheat has been found to be inherited independently of beardedness and chaff colour. Field tests of selections from wheat varieties and crosses throughout the eastern United States have shown that 17 are particularly valuable as regards general rust resistance, while five have given remarkably good yields.

The results of tests with sulphur dust for the control of wheat leaf rust [*P. triticina*] were very satisfactory. In field trials the incidence of infection was markedly reduced, resulting in an increased yield of approximately 10 per cent. for winter and 30 per cent. for spring wheat [cf. ibid., vii, p. 565].

The utilization of numerous inbred strains of several maize varie-

ties resistant to root rot [attributed in Indiana chiefly to toxic iron and aluminium salts in the soil: ibid., iii, p. 33] in different types of hybrid recombinations, showed that some of these have a very wide range of adaptation and a high degree of tolerance to soil deficiencies. The cultivation of uniformly root rot-susceptible inbred lines continues to afford a more satisfactory criterion of test conditions than soil and seed inoculations.

The winter blight or streak type of tomato mosaic has been found to be due to a combination of two viruses, namely, that of ordinary tomato mosaic and one from potatoes [ibid., vii, pp. 481, 605]. Practically every potato plant examined, healthy as well as diseased, contained the latter virus (46 out of 47 in one test). The knowledge of this connexion should assist growers in guarding against tomato streak or winter blight—the latter term being preferred as expressing the fact that the symptoms occur in a severe form only during the autumn, winter, and spring.

The incidence of tomato mosaic has been greatly reduced by the eradication of *Physalis subglabrata* in the vicinity of the tomato fields [cf. ibid., vi, p. 333].

A promising strain of Baltimore tomato resistant to wilt [*Fusarium lycopersici*] has been developed.

Spray tests for the control of apple blotch [*Phyllosticta solitaria*] were continued. The standard schedule, comprising applications at petal-fall and 2, 4, and 6 weeks thereafter, proved reliable, and in the absence of heavy infection, the weak Bordeaux (1–3–50) and lime-sulphur were equal in efficacy to the stronger Bordeaux.

HILL (J. B.). **The migration of Bacterium tumefaciens in the tissue of Tomato plants.**—*Phytopath.*, xviii, 7, pp. 553–563, 1 pl., 1 graph, 1928.

This is an amplified account of the author's work on the migration of *Bacterium tumefaciens* in the tissues of tomato plants suffering from crown gall [*R.A.M.*, vii, p. 431].

STANER [P.]. **Insectes et maladies:** *ex* **Notes sur la culture du Cacao dans les terres rouges de Lukolela.** [Insects and diseases: *ex* Notes on the cultivation of Cacao in the red soils of Lukolela.]—*Bull. Agric. Congo Belge*, xix, 1, pp. 15–22, 1 diag., 1928.

On the whole, cacao trees in the Lukolela region of the Belgian Congo (1° south of the Equator) appear to suffer very little from pests and diseases. Among the latter may be mentioned a general die-back associated with various causes, including the attacks of *Fomes lignosus* [*R.A.M.*, vii, p. 565], and the inability of the roots to penetrate the densely compact limonite soils. The red perithecia of a species of *Hysteromyxa* were found on the trunk of a tree that had died from the latter cause.

Fungous diseases of the pods include those due to *Trachysphaera fructigena*, *Botryodiplodia theobromae*, and *Phytophthora faberi* [ibid., vi, pp. 603, 704, and loc. cit.].

The estimated increase of yield as the result of experiments in spraying twice with 1 per cent. Bordeaux mixture was 60 gm. net weight of cacao per tree, corresponding to a value of Fr. 60,000

for 150 hect. The quantity of copper sulphate used for this area was 750 kg. and the whole area was covered in 23 days, employing a team of 25 men. The cost was Fr. 20,000, leaving a net profit of Fr. 40,000, which should be increased in subsequent years.

MACKIE (W. W.). **A field method of insuring positive attack with some cereal diseases.**—*Phytopath.*, xviii, 7, pp. 617–621, 1928.

After a brief discussion of the difficulties involved in the inducement of artificial epidemics of cereal diseases in the field, the writer describes a method successfully employed by him at Davis, California.

In breeding for agricultural characters in cereals, it is often desirable to hasten the process by growing more than one generation during the year. For some years past a second generation of wheat, barley, and oats has been secured by sowing, with irrigation, seed from the regular June harvest in the July immediately following. These crops may be grown to successful maturity late in November by means of irrigation. They are then harvested, dried, and sown for the next June harvest. At the intermediate November harvest many diseases common to the region appear with epidemic severity, as the climatic conditions during the maturing period are exceptionally favourable in California for the attacks of cereal parasites whose spores are disseminated through the air. By sowing both the resistant and susceptible lines of crosses bred for the genetical study of resistance to disease, and exposing them to various types of artificially induced epidemic infection, it was found possible to obtain a definite record of the inheritance of this character for several successive years, whereas in the ordinary way it was found impossible to secure sufficiently uniform exposure to infection, under conditions favouring attack, in the F_1 and succeeding generations, to provide the necessary statistical data.

It was found that epidemics of the following diseases, in addition to stem rust, could be induced by the method described above: mildew of wheat, barley, and oats (*Erysiphe graminis*), leaf rust of wheat and barley (*P. triticina* and *P. anomala* [*P. simplex*]), spot blotch of wheat (*Septoria tritici*), scald of barley (*Rhyncosporium secalis*), net blotch and spot blotch of barley (*Helminthosporium teres* and *H. sativum*), and crown rust of oats (*P. coronata* [*P. lolii*]).

RUDORF (W.). **Die Verwendung der Sortenimmunität gegen pilzliche Parasiten als Unterscheidungsmerkmal für das Getreidesortenregister.** [The use of varietal immunity from fungous parasites as a differential character for the cereal variety register.]—*Pflanzenbau*, v, 1–2, pp. 4–5, 1928.

In connexion with the forthcoming German register of cereal varieties, the author proposes that varietal reaction towards certain fungous parasites should be used as a differential character. Pending the publication of his original researches on this subject, attention is drawn to Mains's work on physiological specialization in leaf rust of wheat (*Puccinia triticina*) [*R.A.M.*, v, p. 477] as a useful guide in the mode of experimentation. Prerequisite conditions for the efficiency of this method of differentiation are a marked reaction towards the parasites used in the tests, expressed either by com-

plete immunity or by typical symptoms of infection; constancy and unmistakable character of the reaction; and inoculation of each variety with several fungi under accurately regulated conditions.

DRAGHETTI (A.). **I caratteri osmotici quale causa della resistenza dei Frumenti alla ruggine.** [Osmotic characters as the cause of resistance in Wheat to rust.]—*Riv. Pat. Veg.*, xviii, 3–4, pp. 41–64, 1 graph, 1928.

In this paper the author brings forward, in considerable detail, evidence in support of the view that the resistance of certain wheat varieties to rust (*Puccinia* spp.) is largely determined by the edaphic-physiological conditions of the host and the osmotic activity of its cellular fluids, such physiological resistance depending upon the degree of concentration of the osmotically active, nutrient and non-nutrient cellular salts. Rust resistance increases with functional activity from the base to the top of the culms.

The two principal factors which promote the ecological adaptation of wheat are stated to be the awns and the degree of compactness of the ear; from the combinations of these two forms four biological types of adaptation originate, which, in descending order of osmotic activity are (1) aristate or awned type with loose ear, (2) ditto with compact ear, (3) muticous or awnless type with loose ear, and (4) ditto with compact ear. Rieti, Cologna, and many other Italian types notably rust resistant, have loose, awned ears; Gentile Rosso and similar types with loose, awnless ears are less resistant; Noah and Inallettabile Vilmorin, which have compact awnless ears, are very susceptible, while the Squarehead types with awnless, compact, white ears are so susceptible that under Italian conditions in four years out of five their yield is nil. Under natural conditions *Triticum durum* and *T. turgidum*, which have the highest osmotic pressure, are also immune.

The author's observations showed that the upper, most highly mineralized parts of the plant were the most resistant. From this he deduces that some wheat varieties may find a natural defence against fungal attack in the high osmotic tension of the fluids in the parasitized tissues. Adaptation to a saline soil, by establishing a high sap concentration, renders wheat immune from rust. Instances of immunity were observed in Calbigia Rossa and Gentile Rosso wheats, the resistance of which is usually weak, on salt marl soils with a soil solution concentration of about 2 to 3 per thousand, having marked osmotic force. Also, when sea-salt was added at the rate of 2 kg. per 100 sq. m. to soil on which wheat was growing at a high altitude under conditions of humidity very conducive to rust, it was found that while the plants in the adjacent, untreated area were heavily rusted, those in the treated soil showed pustules only on the leaves, the internodes being almost completely unaffected.

The author considers that rust resistance is only indirectly hereditary, the resistance depending on inherited morphological and physiological characters influencing transpiration and the osmotic qualities of the plant.

In a cross between a loose, awned form and an awnless, compact form, the first hybrid is nearly intermediate between the parents. In the segregated generation, the 16 genotypic forms

obtained can be classified thus: 3 awned, loose forms, of which 1 is constant; 1 constant, awned, compact form; 9 awnless, loose forms with 1 constant; and 3 awnless, compact forms, rust resistance descending progressively in the same order.

With reference to the investigations of Pantanelli [*R.A.M.*, i, p. 118], Hurd [ibid., iii, p. 711], and others upon the relation between the cellular fluids and rust resistance, the author repeats that in all the cases examined by him the total content of osmotically active mineral and soluble matter increased rapidly from the base to the top of the culms, while rust infection became more severe as the part affected was situated lower down in the culm. The internodes and the leaf sheaths were invariably the least affected.

The view is expressed that nitrogenous soil dressings conduce to rust by the alteration they effect in the osmotic properties of the cells.

When transpiration is active, the concentration of the cellular salts is high, and vice versa; these are the physiological conditions which determine resistance or susceptibility to fungal attack. Transpirational activity depends not only on external conditions, but on the form and structure of the organs concerned.

It is concluded that osmotically active, non-nutrient salts regulate the plant's absorption of water and serve as an osmotic defence against fungal attack.

Roussakoff (L. F.). Комбинированная шкала для учета развития ржавчины. [A composite scale for the computation of the development of rustiness.]—*Morbi Plantarum*, Leningrad, xvi, 3–4, pp. 179–185, 1 pl., 1927. [German summary. Received August, 1928.]

The author states that the contemporary development of the work of breeding varieties of cereals for immunity from or resistance to rusts (*Puccinia* spp.) has rendered insufficient the various scales hitherto in use for the evaluation of the intensity of infection with these fungi, since none gives a complete picture of the injury done by them. After discussing the drawbacks of these scales and of the method suggested by Naoumoff [*R.A.M.*, iv, p. 423] for calculating the mean degree of infection in the field, he proposes the adoption of a new scale arrived at by combining three factors, namely, the height of attachment of the leaves, the degree of desiccation of the rusted leaves, and the degree of intensity of the disease on leaves at various levels of attachment. It is pointed out that the function of the leaves varies at the different levels on the stem, those on the higher nodes serving to feed the grain as it develops, while the lower ones only serve for vegetative purposes. Infection of the higher leaves indicates, therefore, the greatest danger to the ensuing grain crop. In regard to the second factor, it is pointed out that the presence of the rust on completely dried leaves is not of the same importance as its occurrence on living ones; further, in cases of weak attacks, the proportion of green to withered leaf surface to some degree reflects the reaction of the variety to the disease under various ecological conditions. The

intensity of the disease is measured either by the number of pustules on the leaves or by the surface area of the leaf they cover.

Observations should be made on the development of rustiness six or seven times during the season, in order to follow the course of the disease during the whole of the vegetative period of the plants.

BURTON (G. H.) **Report of Plant Breeder.**—*Ann. Rept. Dept. of Agric. Kenya for the year ended 31st December, 1927*, pp. 231–247, 1928.

The following references of phytopathological interest occur in this report. A number of wheats, mostly of Kabete-hybrid origin, were sown on 2nd February under irrigation at the Scott Agricultural Laboratories for multiplication purposes. All were severely attacked by glume blotch (*Septoria nodorum*) [*R.A.M.*, vii, p. 14].

The main plant-breeding station is now at Njoro (alt. 7,100 ft.), where wheats are being bred for resistance to both black and yellow rusts [*Puccinia graminis* and *P. glumarum*], while at the Scott Laboratories (alt. 5,700 ft.) only the former of these two is regarded, and at Mau Summit (alt. 8,500 ft.) only the latter, the resistance to orange leaf rust [*P. triticina*] being taken into consideration at all three stations. Rust, in general, is a limiting factor to wheat cultivation in Kenya.

As regards resistance to black stem rust, it would appear that lines which survive when grown at the normal time of the year under suitable conditions are liable to succumb in unfavourable surroundings during the hot, damp weather coinciding with the flowering stage in April. Among 33 families consisting of 428 cultures, two outstanding successes in respect of resistance to black rust may be mentioned, viz., 20 cultures of B.F_2.33.A.3. and 4 of B.256.C., the former being susceptible and the latter resistant to orange leaf rust. The line B.F_4.3.B.10.FF.13.(L), which was only slightly susceptible to black rust when sown under normal conditions at the end of March was destroyed by the disease when sown under irrigation at an earlier date. The Kenya Governor variety was only slightly attacked by *P. graminis*.

In connexion with a series of observations on the behaviour of local and imported wheat varieties in regard to black rust, it is mentioned that the Chorlim strain of the susceptible Cross xi [a mixture of varieties: loc. cit.] was slightly infected by *P. graminis* when grown under irrigation early in the year, while the white-chaffed, bearded, late-maturing Sabwani, formerly apparently immune from the disease, was destroyed before coming into ear. It would seem that neither of these lines is generally resistant, but both may be valuable in the Trans Nzoia region.

The Equator wheat variety has maintained its resistance to yellow rust in a number of districts, while Marquis and Kenya proved highly susceptible in cold climates. Generally speaking, in districts where black and yellow rust are equally destructive, the cultivation of the Golden Ball wheat variety or of barley is recommended. Elsewhere Kenya Governor and Equator should, over an average of years, yield higher than any other variety at present known.

FROMME (F. D.). **The control of cereal smuts by seed treatment.** —*Virginia Agric. Exper. Stat. Bull.* 262, 16 pp., 4 figs., 1928.

Seed disinfection tests [of which details are given and the results tabulated], conducted from 1922 to 1926 at the Virginia Agricultural Experimental Station with numerous [named] disinfectants, showed that loose and covered smuts of oats (*Ustilago avenae* and *U. levis*) were completely controlled only by two hours' immersion in a 1 in 320 solution of 40 per cent. formaldehyde. Copper and nickel carbonates at 2 and 4 oz. per bushel failed to give satisfactory control.

Seed immersion for four hours in water held at room temperature, followed by ten minutes' immersion at 129° F., gave complete control both of covered and loose smut of barley (*U. hordei* and *U. nuda*), while satisfactory control of the former was also given by one hour's immersion in 0·75 per cent. formaldehyde.

Wheat bunt (*Tilletia levis*) was satisfactorily controlled by two hours' immersion in 0·5 per cent. semesan and also by copper carbonate dust (2 oz. per bushel). Loose smut of wheat (*U. tritici*) was completely controlled only by hot water treatment. Wheat very severely infected with *T. levis* was submitted to various wet and dry treatments; of the former, super-kalimat, formaldehyde, and uspulun gave the best results (0·1, 0.2, and 0·3 per cent. infection, respectively, as compared with 55 per cent. infection in the control), while of the dry treatments 1762-B, abavit, abavit B, and copper carbonate gave, respectively, 0·1, 0·1, 0·2, and 0·3 per cent. infection, as compared with 67·1 per cent. infection in the control.

The results are also given of tests of the effect of the various disinfectants on the germination of wheat.

ANDREYEFF (N. I.). **Результаты обследования головни в Северо-Кавказском Крае в 1927 году.** [Results of the investigation of smuts in the North Caucasus Region in 1927.]—*Bull. North Caucasian Plant Prot. Stat., 1928,* 4, pp. 3–16, 2 maps, 1928, [German summary.]

The results of a survey made in 1927 in the North Caucasus, for the purpose of examining the health of the cereal crops, showed that in that area wheat bunt (*Tilletia levis* and *T. tritici*) is of the greatest economic importance by far. *T. levis* is the species mainly concerned (causing about 90 per cent. of the total infection), and was especially injurious to winter wheat, the later autumn sowings suffering much more from its attacks than the earlier. Spring wheats which belong to the durum class were less infected, and then chiefly by *T. tritici*. The severity of bunt—due to *T. levis*—appeared to increase from the north southwards and to a less marked degree from the east to the west, but the incidence of *T. tritici* increased from the south to the north. No close relationship could be established between the development of bunt and meteorological conditions, but the disease appeared to occur to a greater extent in localities where the rainfall was greatest during the vegetative period of the crop. The prevalence of bunt in the region surveyed is, in part, explained by defective disinfection of the seed, as in

many localities the growers are still reluctant to adopt this measure.

Barley, both autumn and spring sown, suffered slightly from attacks of *Ustilago hordei* and *U. nuda*, and oats from *U. avenae*. Millet [*Panicum miliaceum*] and maize were attacked to greatly varying degrees by smuts [*U. panici-miliacei* and *U. zeae*]. In the south the incidence of maize smut was as high as 50 per cent., while in the north it was only sporadic. Early sowings of millet in some regions appeared to be entirely immune from smut.

Balakhonoff (P. I.). Головня хлебных злаков в Сальском округе, Северо-Кавказского края за **1927** год. [Cereal smuts in the Salsk district of the North Caucasus region in 1927.]—*Bull. North Caucasian Plant Prot. Stat. 1928,* 4, pp. 17–24, 1928. [German summary.]

The results of the survey of cereal smuts made in 1927 in the Salsk district of the North Caucasus region were in general the same as those of the survey of the whole region [see preceding abstract]. It was noted, however, that winter wheats containing an admixture of rye were more heavily attacked by bunt (*T. levis* with a slight percentage of *T. tritici*) than pure crops, and that the incidence of the disease increased as the admixture was greater; the rye, however, remained immune. Millet [*Panicum miliaceum*] suffered severely from *Ustilago panici-miliacei*, the peasants in many localities complaining of the difficulty of breathing while threshing the grain owing to the clouds of smut spores which arose during the operation.

Morozoff (B.). Головня хлебных злаков в Ставропольском округе по данным обследования **1927** г. [Cereal smuts in the Stavropol district according to the data of the investigation in 1927.]—*Bull. North Caucasian Plant Prot. Stat., 1928*, 4, pp. 25–29, 1928. [German summary.]

The results of the survey of the Stavropol district of the North Caucasus region in 1927 show that in that district the incidence of wheat bunt (*Tilletia levis* and *T. tritici*) was lower than in the rest of the area [see above abstracts] and, on the average, only attained 5·35 per cent. on winter wheats and 0·85 per cent. on spring wheats. Other cereal crops were also but slightly attacked by smuts. It is pointed out, however, that all the crops were much more severely smutted in the valleys than on higher ground.

Mouravieff (V. P.). Зависимость эпифитотий вонючей головни от метеорологических факторов. [Interdependence of epidemics of stinking smut and meteorological factors.]—*Сборник Сортоводно-семенн. Управл. Сахаротреста.* [*Magazine of the Seed Selection Direction of the Sugar Trust*], *1928*, 3(11), pp. 73–94, 5 graphs, 1928.

Winter wheats over the whole of the Ukraine are stated to have suffered severely in 1927 from an epidemic of bunt (*Tilletia levis* and *T. tritici*), the incidence of which attained 70 per cent. in some localities and averaged 55 per cent. in the whole territory of the Republic. A similar epidemic was also observed in 1923, while in

the intervening years the attacks were much lighter. The scope of the investigation described in this paper was, therefore, an attempt to elucidate the causes that determine these epidemic outbreaks in certain years. Field observations and laboratory experiments, coupled with a detailed study of the meteorological factors which prevailed during the period from 1922 to 1927, indicate that there exists a close relationship between the temperature at the time of sowing the winter wheat and the degree of bunt in the ensuing crop. In the author's experiments [admittedly somewhat rough] it was found that the optimum temperature for the germination of wheat lies between 20° and 25° C., for the germination of the spores of both species of *Tilletia* between 10° and 15°, and for the infection of the wheat seedlings between 5° and 10°. In both epidemic years the general trend of the temperature curve during the sowing period in autumn was identical, both being lower than the mean temperature curve for the same period in the whole six years. The temperatures during the subsequent periods of growth of the wheat play no part in determining the incidence of infection, but in the early stages of growth may help the plants to outgrow the parasite and thus to mask the effects of the infection. An indirect proof of the depressing effect of the fungi on the hosts was the observation that the apparently healthy ears in plants raised from contaminated seed were shorter than in the controls, and contained fewer fertile spikelets. Both species of *Tilletia* behaved in the same way under the various temperatures tested. Moisture relations appeared to have no effect on the incidence or further development of the disease.

GAINES (E. F.). **New physiological forms of Tilletia levis and T. tritici.**—*Phytopath.*, xviii, 7, pp. 579–588, 1928.

In extensive wheat bunt surveys conducted from 1918 to 1921, the species occurring in the Pacific Northwest was almost invariably *Tilletia tritici* [*R.A.M.*, iii, p. 264; vi, p. 472], but more recent observations indicated that *T. levis*, in an extremely virulent form, is now spreading in that region. It is believed that this may be a different physiological strain of the fungus from that occurring east of the Rocky Mountains, since the Kanred variety, which is very resistant to *T. levis* in Kansas, proved highly susceptible (80 to 90 per cent. infection) at Moccasin, Montana, in 1927 [cf. ibid., vii, p. 369]. New physiological forms of bunt seem to have been introduced from abroad during recent years.

In a series of tests carried out by Dillon Weston at Cambridge from 1924 to 1927, the Sherman, White Odessa, Ridit, Martin, Hussar, and Berkeley Rock varieties, which are virtually immune from bunt in the United States [ibid., iv, p. 729; vi, p. 661], showed 0·5 to 9 per cent. infection by *T. tritici*. They were, however, much more resistant than Turkey, Kanred, Clackamas, Masters' Perfection, and Fulcaster. A comparative test in 1924 on four varieties indicated little or no difference in pathogenicity between *T. levis* and *T. tritici*.

Preliminary experiments made in 1926 at Pullman, Washington, to determine the relative pathogenicity of German and American material of *T. tritici* on eight Pacific Northwest and four German

wheat varieties, gave clear evidence of different physiological specialization [ibid., vii, p. 435]. The German bunt was more virulent on the American varieties than on those from Halle, only Ridit being highly resistant to both forms. White Odessa and Heil's Dickkopf were each immune from its native bunt, but produced 71 and 42 per cent. infection, respectively, from the foreign inoculum. In a more comprehensive trial at Halle in 1927 [details of which are given and the resulting data tabulated], the bunt from Zurich was the least virulent form and that from Cosel (Germany) the most. The Hohenheimer 77 and Ridit varieties showed considerable resistance to all forms, while Dickkopf, Tubeuf, Hussar, Martin, White Odessa, and Kharkov were resistant to some collections but susceptible to others. Generally speaking, the most virulent strains originated in Germany, those from Hungary were intermediate, while those from Holland, Sweden, and Denmark caused relatively slight infection. In an article on these experiments (*Kühn Arch.*, xix, p. 1, 1928) Dr. T. Roemer suggests that each of these collections is probably a mixture of several strains.

From their reaction on the resistant Turkeys, which probably represent the bulk of the hard red winter wheat of the United States, five forms of bunt may be differentiated as follows: *T. tritici*, Pullman, German, and North Dakota forms, the two first-named infecting Turkey to the approximate extent of 5 and 35 per cent., respectively, while the third appears to attack durum but not Turkey; and *T. levis*, old form and eastern Washington form, causing about 10 and 75 per cent. infection, respectively, on Turkey.

NEUWEILER (E.). **Die Bekämpfung von Getreidekrankheiten durch Beizen.** [The control of cereal diseases by steeping.]—*Landw. Jahrb. der Schweiz*, xlii, 3, pp. 295–360, 1928.

Full particulars are given of a comprehensive series of experiments, conducted on various types of soil in different localities in Switzerland, to determine the relative merits of a number of preparations used for the control of cereal diseases. The results of the trials are discussed and the statistical data presented in tabular form.

The dusts tested gave insufficient protection against wheat bunt (*Tilletia tritici* and *T. levis*) and cannot be recommended as substitutes for the liquid methods. Even where the fungicidal action is shown to be adequate by laboratory tests, the dusts fail to maintain their efficacy in the field. Classing those preparations as effective which result in an increased yield and a reduction of infection to below 1 per cent., the following liquid preparations are deserving of mention: 0·25 per cent. agfa, 30 minutes' immersion; 0·1 per cent. formaldehyde (4 hours); 0·25 per cent. fungolit (1 hour); 0·25 per cent. germisan (30 minutes); 0·25 per cent. kalimat and kalimat B (15 minutes); 2 per cent. basic and neutral Bordeaux mixture (4 hours); 1 per cent. segetan (1 hour); 0·1 per cent. segetanneu (10 minutes); 0·2 per cent. tillantin [uspulun universal] ($1\frac{1}{2}$ hours); and 0·5 per cent. uspulun (2 hours or less). Germisan and kalimat also gave satisfactory control where the sprinkling method was employed. The summer wheat varieties used in these experi-

ments were all adversely affected by disinfection of the seed-grain. Corbin, tar, and formaldehyde at high concentrations caused heavy reductions of yield and failed to control bunt, while brilliant phosphinkupfer, fusariol, higosan, copper acetate, Bordeaux mixture (sprinkling), corrosive sublimate, sublimoform, uspulun (sprinkling and immersion in the 0·25 per cent. solution) were also unsatisfactory.

The snow fungus of rye, *Fusarium* sp. [*Calonectria graminicola*], was controlled by 0·2 per cent. fusariol (sprinkling), 0·5 per cent. germisan (sprinkling), 0·1 per cent. corrosive sublimate (15 minutes' immersion for summer and 1½ hours for winter varieties), and uspulun (sprinkling with 0·3, 0·33, and 0·5 per cent. solutions or 1 to 1½ hours' immersion at 0·5 per cent.). Fusariol gave the highest increase in yield.

Loose smut of oats (*Ustilago avenae*) was not controlled by sprinkling with 0·7 per cent. sublimoform or 0·5 per cent. uspulun.

Only the hot water method of seed disinfection proved effective against loose smut of barley (*U. nuda*), but this treatment requires great care in application.

Tennent (R. B.). **Copper carbonate dust treatment for seed Wheat.**—*New Zealand Journ. of Agric.*, xxxvii, 1, pp. 35–36, 1928.

During the autumn of 1927, some 2,130 bushels of seed wheat were treated with copper carbonate dust at about 2 oz. per bushel against bunt (*Tilletia tritici*), at a central depôt at Otago, New Zealand. Many farmers grew this seed in the vicinity of other seed treated by immersion in copper sulphate or formalin.

Later, fully 90 per cent. of the farmers acknowledged the superiority, in ease of application and effects, of the dust treatment over either of the others, a conclusion stated to have been amply borne out in experiments conducted by the Department of Agriculture.

Sixty per cent. of the farmers who compared the dry with the formalin treatment stated that the former gave a higher percentage germination, while 40 per cent. considered the two treatments equal in this respect; 55 per cent. also considered that the dusted wheat germinated more rapidly than that treated with formalin, and 45 per cent. noted no appreciable difference in this respect.

Fifty-nine per cent. of the farmers who compared the dusted seed with that treated with copper sulphate reported a higher percentage germination in the former, 35 per cent. considered that the germination was the same, and 6 per cent. reported lower germination of the dusted seed; 59 per cent. stated that the dusted seed germinated much more rapidly than that treated with copper sulphate.

Baldrati (I.). **Urocystis occulta (Wallr.) Rabenh. parassita del Frumento in Italia.** [*Urocystis occulta* (Wallr.) Rabenh. as a parasite of Wheat in Italy.]—*Il Coltivatore*, lxxiv, 21, pp. 79–81, 1928.

Referring to a recent report of *Urocystis occulta* [*U. tritici*] as a new parasite on wheat in Italy, the author states that he observed this fungus also on wheat in various parts of Italy between 1897

and 1902, and wrote an account of it, accompanied by a coloured plate (*Ital. Agric.*, 21, November, 1900). He considers that *U. occulta* has very probably long been present and relatively widespread on wheat in Italy, and in serious attacks, such as he observed and figured, can completely destroy the young plants, which alone show the disease.

DICKSON (J. G.) & HOLBERT (J. R.). **The relation of temperature to the development of disease in plants.**—*Amer. Naturalist*, lxii, 681, pp. 311–333, 8 figs., 1928.

The authors here recapitulate the principal results of their study on the relation of temperature to the development of seedling blight (*Gibberella saubinetii*) in wheat and maize [*R.A.M.*, ii, p. 536; vi, p. 366]. It is stated that seedlings of these plants growing under favourable conditions for their development form cell walls in the epidermal region and the endodermis, which are impregnated with suberin in maize and principally with lignin in wheat. These same substances accumulate in the cell walls around the ruptures in these tissues caused by the emergence of the primary and adventitious roots. When, however, the seedlings are grown under unfavourable conditions (high temperatures for wheat and low temperatures for maize) the walls, so far from having these impermeable substances, are not even formed of true cellulose, but remain in the intermediate pectin-like state. The parasite can grow between such cells, feeding on the pectin and xylan of the walls. No corky walls form around the root ruptures and the site of these permits the entry of the fungus. In resistant maize plants the suberin layers are more numerous and more heavily impregnated than in susceptible varieties. The changes dependent on temperature are the result of differences in the metabolism of the plants under different conditions. Some details of these are given.

NOBLE (R. J.). **Oat smuts.**—*Agric. Gaz. New South Wales*, xxxix 7, pp. 516–518, 2 figs., 1928.

The author recommends for the control of loose and covered smut of oats (*Ustilago avenae* and *U. levis*) sprinkling the seed-grain with formalin (1 lb. to 40 galls. of water) at the rate of rather less than 1 gall. of the solution per bushel of seed, and subsequent covering with wet bags or canvas for four to five hours. Treated grain should be sown as soon as possible. If the seed is dipped in the solution it is difficult to dry it sufficiently for sowing. Copper carbonate dust, 2 to 3 oz. per bushel, gives satisfactory control only when the seed is obtained from lightly diseased crops.

BRANSTETTER (B. B.). **Corn root rot studies.**—*Missouri Agric. Exper. Stat. Res. Bull.* 113, 80 pp., 8 pl., 1 graph, 3 diags., 1 map, 1927. [Received September, 1928.]

This is a very comprehensive survey of the etiology, prevalence, and development of maize root rot, with special reference to the condition governing the occurrence of the disease in Missouri [*R.A.M.*, vii, p. 364].

It is pointed out that the problem is of a very complex nature,

few attempts having yet been made to differentiate the various aspects of the trouble and to form correct estimates of the relative importance of each.

Maize root rot is defined as a disease primarily affecting the roots and causing them to rot before the plant attains maturity. Seedling blight affects seedlings only, causing their death or arrested development. Ear rot and stalk rot are diseases resulting from infection by the seedling blight fungi and probably other organisms as well.

In a survey of seed maize carried out during the winter of 1921–2, it was found that the tip one-fifth of every internally infected maize kernel contains one or more fungi, while the remainder of the kernel may or may not be diseased. Most of the kernels examined were internally infected by *Fusarium moniliforme* [*Gibberella moniliformis*], *Diplodia zeae*, or *Cephalosporium acremonium*. Ears with kernels infected by *G. saubinetii* were extremely rare. Possibly this is correlated with the scarcity of wheat scab in Missouri as compared with Illinois, Indiana, and Delaware.

Certain physical ear and kernel characters [which are enumerated] have proved to be reliable guides in the selection of seed maize comparatively free from fungous infection. This method of selection is considered to be quite as effective as, and more practical than, the germinator system for the elimination of badly diseased ears.

Seed treatment with alcohol, followed by one hour's immersion in 1 in 1,000 mercuric chloride, was found to effect a great reduction in the amount of seedling blight when the seed was grown on the germinator for eight or nine days, but the incidence of root rot in the field was not decreased by this method and the stand was materially diminished. Under Missouri conditions there was found to be no difference in yield from planting heavily or lightly infected seed in such cases as yielded an equal stand of plants from each lot of seed. Reduced yields from planting diseased seed are stated to be entirely due to seedling blight and its after-effects and not to the later root rot.

Field experiments conducted on soil infected by root rot gave no promise of controlling the disease by planting healthy seed or by treating the soil with liberal applications of phosphate and limestone, singly or in combination. Root rot does not occur on healthy maize seedlings grown in virgin soil or in sterilized soil from infected fields. Uninfected soil inoculated with the above-mentioned fungi produces a certain amount of seedling blight in the greenhouse, but no root rot in the surviving plants. Healthy seedlings grown in soil from infected fields which was first sterilized and then inoculated with diseased maize roots developed fairly well in the greenhouse, but had badly rotted root systems.

A *Pythium*-like fungus with spherical oogonia, 30 to 32 μ in diameter, and oospores measuring 28 to 30 μ in diameter, was isolated from diseased maize roots growing in infected soil [loc. cit.]. The roots of young maize plants were successfully inoculated with this organism, which was reisolated in pure culture from the infected individuals.

The results of these investigations are considered to point to the

Pythium-like fungus as the chief agent of maize root rot as distinct from seedling blight in Missouri.

A bibliography of 126 titles is appended.

IMMER (F. R.) & CHRISTENSEN (J. J.). **Influence of environmental factors on the seasonal prevalence of Corn smut.**—*Phytopath.*, xviii, 7, pp. 589–598, 1 graph, 1928.

A study was made at University Farm, St. Paul, Minnesota, of the effect of certain environmental factors on the incidence of maize smut (*Ustilago zeae*) in artificially induced epidemics from 1922 to 1927, inclusive [*R.A.M.*, v, p. 224]. A comparison was also made of the reactions of selfed lines of maize (*a*) to normal field infection, and (*b*) to hypodermic inoculation with the causal organism under field and greenhouse conditions.

The results of the experiments [which are tabulated and discussed] showed that dry weather conditions, as expressed by a small number of rainy days and a high percentage of sunshine, are conducive to the prevalence of smut. Temperature was found to be of somewhat less importance than the foregoing factors in determining the incidence of infection.

Maize seedlings proved to be very susceptible to smut when hypodermically inoculated, the diseased individuals frequently succumbing to the attacks of the fungus. Under natural conditions, however, seedling infection resulting in gall formation appears to be comparatively rare, possibly on account of some inherent morphological or functional resistance. A correlation of $0{\cdot}40 \pm 0{\cdot}10$ was found between natural infection in a smut epidemic and artificial infection of the same strains by hypodermic inoculation with a mixture of eight physiological forms of the fungus. Some lines of maize proved resistant to both natural and artificial infection on reaching a height of 3 ft., while others were resistant to the former and susceptible to the latter type of infection.

GARBER (R. J.) & HOOVER (M. M.). **The relation of smut infection to yield in Maize.**—*Journ. Amer. Soc. Agron.*, xx, 7, pp. 735–746, 1928.

In continuation of previous investigations at the West Virginia Agricultural Experiment Station on the relation of smut (*Ustilago zeae*) infection to yield in maize [*R.A.M.*, iv, p. 602], further data are presented in connexion with the project of breeding resistant varieties.

It was found that selfed lines of maize differing sharply in respect of smut-resistance could be isolated. Susceptible lines were further shown to vary widely with regard to the localization of smut infection, some being generally susceptible while others are predominantly susceptible in certain regions of the plant, e.g., the tassel, below the ear, at the neck, or at the base of the stalk.

The greatest reduction in yield among maize plants of the same genotype was caused by sterility induced by the fungus. The incidence of sterility among 1,188 smut-free plants from selfed lines was 19·8 per cent. compared with 38 per cent. among 868 infected plants from the same selfed lines; the sterility among 469 smut-

free F_1 plants was 0·6 per cent., while that among 531 diseased F_1 plants was 6·6 per cent. It was impossible to demonstrate any appreciable decline in yield owing to smut infection among maize plants of the same genotype, other than that caused by sterility induced by the fungus. Maize plants showing only tassel infection gave higher average yields than healthy individuals of similar genetic constitution.

IMMER (F. R.) & CHRISTENSEN (J. J.). **Determination of losses due to smut infections in selfed lines of Corn.**—*Phytopath.*, xviii, 7, pp. 599–602, 1928.

From the data obtained in a study on pairs of plants, one diseased and the other healthy, of the same selfed lines of maize, it seems probable that the losses caused by smut (*Ustilago zeae*) [see preceding abstract] in the United States have been under-estimated in the *Plant Disease Reporter* at over 47,000,000 bushels per annum. Little information has hitherto been available concerning the reduction in yield caused by smut galls on otherwise apparently healthy plants. It was shown that the production of shelled maize is substantially reduced by medium-sized or large galls. A larger decrease was found to occur as the result of galls formed above the ear than when they are situated below this point (94 as compared with 53 per cent. in the case of large galls).

UPPAL (B. N.) & KAMAT (M. N.). **Artificial infection of Pennisetum typhoideum by Sclerospora graminicola.**—*Agric. Journ. of India*, xxiii, 4, pp. 309–310, 1928.

An important disease of the widely cultivated bajri [bulrush millet] (*Pennisetum typhoideum*) crop in the Bombay Presidency is the downy mildew caused by *Sclerospora graminicola* [*R.A.M.*, vii, p. 712]. An experiment was carried out to determine the mode of hibernation of the fungus. *P. typhoideum* seeds were grown in pots, in which oospores of the fungus were added to the soil, and kept under very humid conditions. Symptoms of the disease began to appear on the third leaf of the emerging seedlings, the first and second apparently remaining healthy. In many cases 60 per cent. of the plants became infected. Sporulation occurred on leaves placed in darkened Petri dishes within five to six hours at 15° to 17° C. in a saturated atmosphere. The sporangia were found to germinate readily and produce zoospores at this temperature.

DUFRÉNOY [J.]. **Les maladies du Cédratier.** [The diseases of the Citron.]—Paris, Service Agric. de la Cie P.L.M., 13 pp., 8 figs., 1927. [Received October, 1928.]

In this paper, read at a meeting of the 'Ligue nationale de lutte contre les ennemis des cultures' [*R.A.M.*, vi, p. 429] held at Lyons from 28th to 30th June, 1926, the author describes the symptoms of brown rot and gummosis of citrons [*Citrus medica*] caused by *Phytophthora citrophthora* and *P. parasitica* [ibid., vi, p. 224]. Attention is drawn to the necessity of liming the soil, as the absence

of lime is said to predispose to infection by the fungi in question, as well as by *Colletotrichum gloeosporioides* [ibid., vii, p. 441].

BLACKMAN (V. H.). **Report on the sulphuric acid treatment of Cotton seed.**—*Empire Cotton Growing Review*, v, 3, pp. 240–241, 1928.

Experiments [which are briefly described, and the results of which are tabulated] indicated that the immersion of cotton seed in concentrated sulphuric acid for twenty to thirty minutes, followed by washing in several changes of water for twenty minutes, can safely be used where the sulphuric acid method for delinting and surface sterilization [e. g., against *Bacterium malvacearum*] is employed. Viability remained unimpaired, and even an exposure for as long as six hours to the strong acid had no injurious effect. On the other hand, dilute sulphuric acid did not delint the seed, and seriously reduced its germinating power.

FAHMY (T.). **The Fusarium disease of Cotton (wilt) and its control.**—*Min. of Agric., Egypt, Tech. and Sci. Service (Plant Protect. Sect., Mycol. Res. Div.) Bull.* 74, 106 pp., 50 pl. (2 col.), 3 graphs, 1 map, 1928.

This is an amplified account of the author's investigations on the *Fusarium* disease of cotton (*F. vasinfectum* var. *egyptiacum*), a detailed notice of which from another source has already been given [*R.A.M.*, vii, p. 318].

MACLEOD (J. M. H.), RAMSBOTTOM (J.), WHITFIELD (A.), MANSON-BAHR (P. H.), GASKELL (A.), & DOWLING (G. B.). **Discussion on tropical mycoses.**—*Proc. Roy. Soc. Med.*, xxi, 7, pp. 1285–1297, 10 figs., 1928.

The main point arising out of this discussion on tropical mycoses is the urgent necessity for a satisfactory botanical classification of the causal fungi. The varying types of lesions produced by the same fungus, and the similarity of the symptoms induced by widely differing organisms, render the current clinical or medical classification of these organisms very inadequate.

ÉMILE-WEIL [P.], CHEVALIER, & FLANDRIN [P.]. **Splenic tumours due to fungi** [translated title].—*Le Sang, 1928* (ii), p. 361, 1928. [Abs. in *The Lancet*, ccxv, 5483, pp. 665–666, 1928.]

The authors describe the case of a young man who suffered from progressive splenomegaly from 1920 to 1923. On splenectomy the affected organ was found to contain dense, firm tumour masses composed of lymphoid cells, with scanty larger cells having two or more nuclei. Further examination revealed the presence, in the haemorrhagic areas, of filiform structures believed to be the mycelial elements of a fungus [*R.A.M.*, vii, p. 377], which stained well with ferrocyanide and hydrochloric acid. Attention is drawn to the importance of this independent confirmation of A. G. Gibson's similar discovery in 1913 [ibid., vii, p. 633], and to its bearing on Hodgkin's disease.

À propos du mémoire de M. Langeron: Que penser des mycoses de la rate? Réponses de MM. Nanta, P. Émile-Weil, Pinoy. Réponses aux objections de MM. Nanta, P. Émile-Weil et Pinoy par Maurice Langeron. [Concerning Langeron's memoir on splenic mycoses. Replies of Nanta, P. Émile-Weil, and Pinoy. Reply to these criticisms by Langeron.]—*Presse Méd.*, xxxvi, 37, pp. 579–581, 1928. [Abs. in *Trop. Dis. Bull.*, xxv, 9, pp. 749–750, 1928.]

In connexion with the discussion now proceeding on the etiology of splenomegaly [see preceding abstract], Pinoy considers that Langeron has confused the mycotic and bacterial forms of the disease. *Aspergillus nantae* is regarded only as a biological form of *A. nidulans*. Langeron's replies to his critics are briefly summarized.

PÉLÉVINE (A.) & TCHERNOGOUBOFF (N.). **Nouvelles données dans la doctrine de la trichophytie.** [New data in the etiology of trichophytosis.]—*Acta Dermato-venereologica*, viii, 6, pp. 397–446, 2 pl. (1 col.), 27 figs., 1928.

The results of the authors' studies on cutaneous trichophytoses in five members of the same family of Russian peasants are presented in considerable detail. The organism responsible for the condition was identified as *Trichophyton violaceum*, which is reported to cause 70 per cent. of all cases of trichophytosis in the Moscow area [cf. *R.A.M.*, vii, p. 719].

LOURIER (A.) & ZWITKIS (E.). **Herpes tonsurans, Mikrosporie und Favus der Augenbrauen und Wimpern.** [Herpes tonsurans, microsporosis, and favus of the eyebrows and eyelashes.]—*Dermatol. Wochenschr.*, lxxxvii, 29, pp. 1019–1022, 1928.

Clinical details are given of nine cases of herpes tonsurans, microsporosis, and favus of the eyebrows and eyelashes examined at Kiev (Ukraine). Seven of the affected individuals were between 8 and 15 years old, one was 30, and one 33. *Trichophyton violaceum* was isolated from three out of six cases from which cultures were made and *Microsporon* sp. from the other three.

MILIAN (G.) & PHOTINOS [P.]. **Trichophytie cutanée généralisée pustuleuse, consécutive à un kerion du cuir chevelu.** [Generalized pustular cutaneous trichophytosis as a sequel to a kerion of the scalp.]—*Rev. Franç. de Dermatol.*, iv, 5, pp. 266–272, 3 figs., 1928.

A nine-year-old boy developed pustular cutaneous trichophytosis on the face, body, arms, and thighs as a sequel to a kerion of the scalp caused by *Trichophyton gypseum asteroides* [*R.A.M.*, vii, p. 719]. Brief notes are given on the cultural characters of the fungus, together with some observations on the clinical symptoms, mode of infection, and treatment of the condition.

DELAMARE (G.) & GATTI (C.). **Sur la piedra du Paraguay.** [On the 'piedra' of Paraguay.]—*Bull. Acad. Méd.*, Sér. III, xcix, 19, pp. 500–503, 1928.

An account is given of the so-called 'piedra' disease due to *Trichosporum* in Paraguay, where young men appear to be chiefly

affected. The nodules are found mostly on the relatively long hairs near the top of the head. They vary in number from two to five per hair, occurring as cylindrical or ovoid, dark, hard masses on the hair shafts. Microscopic examination of the nodule shows a mass of refractive cellules (6 by 4·5 μ), branching mycelium, cysts of Horta (60 by 30 μ) containing flagellate elements (40 to 50 by 4·5 μ) [these cysts were described by Horta as containing 8 fusiform bodies with a flagellum at each end, and Pinoy is inclined to regard them as asci with ciliate ascospores], and a ground substance showing black granules. The cultural characters of the fungus, which is considered to be more nearly identical with *Trichosporum hortai* [*R.A.M.*, vi, p. 485] than with *T. giganteum*, are briefly described.

SMITH (E. C.). **Tinea flava (Castellani).**—*Journ. Trop. Med. and Hygiene*, xxxi, 14, pp. 169–173, 12 figs., 1928.

Tinea flava (pityriasis versicolor flava) is stated to be probably the most widespread skin lesion encountered at Lagos (Nigeria). The clinical appearance of this condition may assume a variety of forms [which are briefly described]. The hair follicles may be involved to a considerable depth. Attempts to reproduce the symptoms of tinea flava by placing scrapings from typical areas in prolonged contact with normal skin gave negative results. Using the methods recommended by Acton and Panja on the one hand, and by Macleod and Dowling on the other [*R.A.M.*, vii, pp. 325, 637], the writer isolated, from scrapings of typical cases, a fungus [? *Pityrosporon ovale*] characterized by yeast-like, Gram-positive bodies resembling ninepins and sometimes accompanied, in old cultures, by short hyphae shaped like curved handles. It is suggested [though definite proof was not forthcoming] that this is the etiological agent of the disease.

HOMMA (YASU). **On the powdery mildew of Flax.**—*Bot. Mag. (Tokyo)*, xlii, 499, pp. 331–334, 2 figs., 1928.

In September, 1922, both surfaces of the leaves and the stems of flax in a greenhouse at the Hokkaido Imperial University, Sapporo (Japan), were found to be attacked by a mildew characterized by ellipsoidal or oblong-ellipsoidal conidia, 30 to 38·4 by 19·4 to 24 μ, borne on uni- to biseptate conidiophores measuring 62·4 μ in length; by perithecia 91 to 105 μ in diameter with about eight appendages, 168 to 217 μ long, brown towards the base, and having 5 to 7 septa; and by ovate, hyaline asci (usually six to each perithecium) measuring 48 to 55·2 by 24 to 31·12 μ and containing two or three ascospores (rarely one), which are ellipsoidal, hyaline, and measure 18 to 20·4 by 9·8 to 12 μ. The mycelium is evanescent, disappearing before the perithecia mature, and the hyphae send small ellipsoidal or globular haustoria into the epidermal cells. These characters agree with those of *Erysiphe polygoni*, as already reported by the writer in her paper in *Horticulture*, xix, p. 13, 1927 (Japanese).

In September, 1926, a second species of flax mildew was observed in the same greenhouse. It also occurred on both leaf surfaces and on the stems. The conidia are oblong or cylindrical-oblong, containing fibrosin bodies [*R.A.M.*, vi, p. 511] and measuring 26·4 to 36 by 12 to 14·4 μ (usually exceeding 27 by 12 μ). These characters

are clearly distinct from those of the conidial stage of *E. polygoni*, but agree with those of the mildew found in the conidial stage by Škorić and named *Oidium lini*, and subsequently reported by Salmon and Ware from Cambridge [ibid., vi, p. 727]. From the general characters of its conidia there is stated to be no doubt that it is a species of *Sphaerotheca*, but it remains to be seen whether it belongs to a new species of this genus or to one already known in the perithecial form. Meanwhile the specific name *O. lini* Škorić is regarded as the correct name for this form of flax mildew.

Atanasoff (D.). **Mosaic disease of flower bulb plants.**—*Bull. Soc. Bot. de Bulgarie, 1928*, 2, pp. 51–59, 1928.

After a brief review of the previous literature on the mosaic diseases of flowering bulb plants, the author gives some details of his studies of this type of disease in tulips, hyacinths, narcissi, lilies, crocuses, *Muscari comosum*, *M. comosum compactum*, *M. botryoides*, *Iris hispanica*, *Nerine sarniensis*, *Allium neapolitanum*, and *A. moly*, made in 1925 at the International Spring Flower Show in Heemstede-Haarlem, Holland, and in the neighbouring flower fields. A brief description is given of the symptoms in each of the hosts, although they are stated to be very much the same in all and to resemble closely those of mosaic in grasses. Artificial infection experiments on tulips, hyacinths, and narcissi through aphids and by means of juice inoculation showed that all three diseases are readily transmitted to healthy narcissi and tulips. It is pointed out, however, that the experiments with aphids were on the whole inconclusive, and that these insects appear to avoid hyacinths and narcissi, thus indicating that there must be other agencies which serve to spread the disease. The experiments also gave inconclusive results on hyacinths, owing to the difficulty of obtaining sufficient disease-free material: the several hundred hyacinth bulbs collected by the author in Holland as free from mosaic in 1926 and transported to Bulgaria, gradually developed as much disease as the originally infected plants and degenerated very rapidly.

Control should consist in prompt destruction of all infected plants early in the spring, as soon as the symptoms become apparent. All varieties which are known to be entirely affected or practically so, such as some varieties of narcissus, and also the 'broken' varieties of tulips, which are stated to be nothing else than mosaic-sick plants [*R.A.M.*, vii, p. 723], should be destroyed or grown at a distance from healthy plants. In order to shorten the period during which the plants are exposed to infection, the bulbs should be lifted as early as possible. The hot water treatment (43° to 44° C. for 4 hours), which has given good results in the control of nematodes, does not eliminate the mosaic virus.

Ignatius (J. G. W.). **Het mislukken van Hulst-veredlingen ten gevolge van Thielavia basicola-aantasting. Voorloopige mededeeling.** [The failure of Holly grafts as a result of infection by *Thielavia basicola*. Preliminary note.]—*Tijdschr. over Plantenziekten*, xxxvi, 7, pp. 200–203, 1 pl., 1928. [English summary.]

An investigation was made to determine the cause of a disease of

holly varieties propagated by grafting on *Ilex aquifolium* under glass. The plants were found to be infected by *Thielavia basicola*, the sooty mycelium of which covered the wound surfaces, while the chlamydospores occurred on the roots, collar, and stems of the stocks. Inoculation experiments with the fungus on healthy holly plants gave positive results. The average temperature of the soil in which the affected plants were grown was 23° to 27° C. [cf. *R.A.M.*, vii, p. 279]. Infection may be prevented by the use of well-matured stocks and by the sterilization of the grafting wounds with a standard fungicide, such as corrosive sublimate or uspulun.

Lobik (A. I.). ,,Прель" Подсолнечника, вызываемая грибком склеротинии **Sclerotinia libertiana Fuck.** (Предварительное сообщение). [Sunflower rot caused by the fungus *Sclerotinia libertiana* Fuck. (Preliminary communication).]—*Изв. Терской Окружной Станции. Защ. Растений* [*Terek Regional Plant Prot. Stat. News*], i, 3–4, pp. 13–33, 1926. [French summary on pp. 85–86. Received August, 1928.]

This is a preliminary report of investigations started in 1925 at the Terek Regional Plant Protection Station [north Caucasus] in view of the threatening spread of *Sclerotinia libertiana* [*S. sclerotiorum*] rot of the sunflower [*Helianthus annuus*: *R.A.M.*, vi, p. 730] throughout the northern Caucasus. While in former years the disease could only be found after prolonged search, in 1925 and 1926 its incidence was general, reaching in some localities a percentage of 50 to 75, and averaging in 1926 from 15 to 20 per cent. in the whole area surveyed.

After giving a detailed description of the symptoms, the author outlines his field and laboratory studies of the biology of the organism and the process of infection of the host. The results so far obtained may be summarized as follows. The life-cycle of *S. sclerotiorum* was found to be sclerotium—apothecium—spore—mycelium—sclerotium, and no other stage was obtained under either natural or artificial conditions. In the presence of sufficient moisture, apothecia were produced with equal facility by sclerotia collected from the host or grown on artificial media; they developed without any resting period or previous freezing of the sclerotia, and their formation was not greatly influenced by differences in temperature. It was noted, however, that sclerotia less than 2 mm. in diameter did not produce apothecia. Broken sclerotia formed a mycelium at the surface of fracture, which after a time reconstituted the black tegument.

The initial infection of the sunflower in the field is caused by the ascospores, which are ejected to a distance of 10 to 15 cm. It was shown that the ascospores can infect the host either through slight wounds in the epidermis or when they lodge in the axil of a leaf. There was evidence that the mycelium arising from ascospores is more infective than that formed by broken sclerotia as described above. After the establishment of the initial infections, the further spread of the fungus occurs through the soil; from the infected point of the stem, the mycelium grows down into the roots, eventually reaching their distal ends and passing into the soil, where it continues to grow until it reaches the roots of neighbour-

ing plants. Under favourable conditions, the mycelium may also grow on the surface of the soil. Besides ascosporal infection the plants may also be infected by small fragments of mycelium carried by insects, birds, or small rodents, e.g., field mice, and this is believed to be the usual method of infection of the inflorescences. In the laboratory the mycelium was shown to be capable of penetrating the uninjured epidermis of the stems when kept sufficiently moist.

Experiments to test the pathogenicity of *S. sclerotiorum* from sunflower to other plants, showed that under local conditions its host range is very limited, the only weed entirely susceptible to it being *Sonchus arvensis*. The relative susceptibility of the other plants tested is listed in the following decreasing order: lettuce, carrots, cucumbers, cabbage, tobacco, and tomato. In storage the fungus was also found to rot celery and parsnips, but not potatoes or beets.

The main measures recommended for the control of the fungus are based on the observation that in fields, of which the surface was kept free from weeds and in good tilth, the sclerotia entirely failed to form apothecia and the plants remained healthy, while under the cover of weeds apothecia were formed in great abundance, and the plants were severely attacked along the direction of the prevailing wind. Crop rotation should therefore be planned so as to alternate sunflower with other crops requiring careful weeding and good tillage. All sunflower stubble and roots should be thoroughly removed and destroyed by fire, to avoid the accumulation of sclerotia in the soil. Care should also be taken to use seed from healthy sources, as there is evidence that the disease was brought into the region with diseased seed.

JONES (F. R.) & WEIMER (J. L.). **Bacterial wilt and winter injury of Alfalfa.**—*U.S. Dept. of Agric. Circ.* 39, 8 pp., 2 figs., 1928.

Bacterial wilt [*Aplanobacter insidiosum*] and winter injury of lucerne [*R.A.M.*, vii, pp. 101, 365] appear to be largely responsible for the premature decay of the stands in the central Mississippi Valley and other parts of the United States. Winter injury causes the death of buds and parts of the roots and crowns of lucerne plants, thereby producing wounds through which the wilt bacteria can readily enter. Probably the wilt disease can best be prevented by protecting the healthy young stands from contact with contaminated water from diseased fields. Care should also be taken to avoid conveying the bacteria to new fields in fragments of stems of diseased plants, either mixed with uncleaned seed or as unrotted refuse from lucerne hay with manure. The use of winter-hardy varieties may reduce the incidence of bacterial wilt but cannot altogether prevent its occurrence.

LOBIK (A. I.). Паразитные грибки плодовых деревьев и меры борьбы с ними. [Fungi parasitizing fruit trees and their control.]—*Изв. Терской Окружной Станции Защ. Растений.* [*Terek Regional Plant Prot. Stat. News*], ii, 1–2 (5–6), pp. 20–83, 1927. [French summary on pp. 134–135. Received August, 1928.]

After briefly describing the deplorable condition of the fruit-growing industry in the Terek province [North Caucasus], chiefly

due to lack of agricultural education, the author gives semi-popular descriptions of the most prevalent fungal diseases of the fruit trees, including some saprophytes which might under favourable conditions become pathogenic. Most of the diseases are well known in phytopathological practice, but the following are of more particular interest. *Sphaeropsis malorum* [*Physalospora cydoniae*: *R.A.M.*, v, p. 746] causes on apple leaves brown, rounded or irregular spots, from 1 to 1·3 cm. in diameter; the pycnidia are immersed and 181·5 to 214·5 μ in diameter, while the spores are faintly brownish, pear-shaped or ovoid, and measure 16·5 to 36·2 by 10 to 16·5 μ. *Macrosporium caudatum* forms on the leaves of the same host diffuse or well defined, zonate spots, varying in size, dark brown in the centre and becoming lighter towards the margins; on their upper surface they bear a black, velvety efflorescence consisting of tufts of septate conidiophores, 49·9 to 98·7 by 3·3 to 5 μ in diameter; the conidia have from 3 to 8 transverse septa and one longitudinal one, and are 29·6 to 62·5 by 10 to 16·5 μ in diameter. *Fomes igniarius* attacks living stems and branches of apple trees, *Polyporus squamosus* and *Trametes trogii* occur on dead stumps, and *Cytospora capitata* on dry branches. *Phyllosticta pirina* and *P. piricola* both are found on pears. The former causes on the leaves rounded or irregular, grey or greyish-brown spots, from 2 to 5 mm. in diameter, with a narrow dark brown margin; the pycnidia are polyhedric, 72 to 115 μ in diameter, and contain ovoid or elliptical spores of a faint light olive-green colour in mass, measuring 3 to 6·6 by 2 to 3·3 μ. *P. piricola* forms on the leaves diffuse light brown or yellowish spots with immersed pycnidia, measuring 82 to 122 μ in diameter, on the lower side; the spores are baculiform with rounded ends and differ from the published diagnosis of this species in their larger size (3·3 to 4·2 by 0·8 μ instead of 2 to 2·5 by 0·7 to 1 μ). Plums are attacked by *Polystigmina rubra* which, in its turn, is parasitized by *Gloeosporium polystigmicolum* Bond. The latter develops in early summer on the spore beds of *P. rubra*, which turn at first a dark brown and then greyish, gradually drying up and falling out of the leaf tissue. The fructifications of *G. polystigmicolum* consist of a dense weft of mycelium on which arise hyaline, elongated conidiophores, measuring 16·5 to 75 by 3 to 4·2 μ and bearing conidia which are 13·2 to 26·3 by 4 to 5·5 μ in diameter. In some of the fructifications the conidiophores are interspersed with dark brown, aciculate setae, up to 56 μ in length. *Cercospora cerasella* forms on cherry leaves reddish-brown, rounded spots with a narrow, dark purple margin. The spots bear on both surfaces small tufts of rusty-brown conidiophores measuring 29·7 to 56 by 3·3 to 3·6 μ; the conidia are somewhat swollen at their base and tapering towards the apex, with 2 to 4 transverse septa, and 26·4 to 45 by 3·3 to 4·8 μ in diameter.

A careful investigation of the sooty mould which forms every autumn in great abundance on the leaves of plums, apples, apricots, species of *Ulmus* and *Fraxinus*, and some herbaceous plants, showed that it consists of species of *Alternaria*, *Cladosporium herbarum*, and *Sporotrichum foliicola*, sometimes accompanied by other fungi. Inoculation experiments indicated that the first to develop is *S. foliicola*, which establishes itself on various organic

substances, including pollen, that are deposited during the summer on the surface of the leaves.

Control measures are indicated in each case, and in a separate section detailed instructions are given for the preparation and application of the usual fungicidal sprays and dusts that are recommended.

GOODWIN (W.), SALMON (E. S.), & WARE (W. M.). **Control of Apple scab on Allington Pippin and Newton Wonder by two types of Bordeaux mixture.**—*Journ. Min. Agric.*, xxxv, 3, pp. 226–235, 1928.

To compare the relative efficacy of Bordeaux mixture prepared with quicklime and that made with commercial hydrate of lime [*R.A.M.*, vii, p. 189] in the control of apple scab [*Venturia inaequalis*], 12 trees each of the Allington Pippin and Newton Wonder varieties were sprayed with the latter and 12 and 15, respectively, with the former, on 2nd and 23rd May and 13th June, 1927, 12 trees of the former and 15 of the latter variety being left unsprayed.

The results of the tests [which are tabulated] show that the fungicidal properties of the two mixtures were identical and eminently satisfactory.

Infection in the unsprayed Allington apples amounted to 93 per cent., and in the unsprayed Newton Wonders to 86 per cent., by weight, of the total crop. In the plots sprayed with the hydrate of lime mixture the percentage weight of scabbed fruit was only 12 in each variety, while with the quicklime mixture the figures were 12 and 14 per cent., respectively. No appreciable leaf scorch resulted from the spraying, and russeting of the fruit was noticeable only in 2·5 to 3 per cent. of the Allingtons and 0·2 to 0·6 per cent. of the Newton Wonders.

It is emphasized that in home-made Bordeaux mixture growers have a sure protection against scab on these two varieties of apple as well as on Bramley's Seedling. Spray injury often results from excessively copious second and third applications; at the latter, the spray should be confined, as far as possible, to the foliage on the newly formed wood.

ZIMMERMANN (F.). **Schorfbekämpfungsversuche in Nordböhmen.** [Scab control experiments in northern Bohemia.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxviii, 7–8, pp. 208–215, 1928.

In an experiment [details of which are given] on the control of apple scab (*Fusicladium dendriticum*) [*Venturia inaequalis*] in an extensive fruit-growing area of northern Czecho-Slovakia, 10 heavily infected London Pippin trees were given two applications of 1·5 per cent. nosprasen, 10 received the same treatment in addition to a dormant application of 3 per cent. solbar, and 10 were left untreated. The best results were given by nosprasen alone, which increased the percentage of sound fruit from $11{\cdot}1 \pm 2{\cdot}1$ to $78{\cdot}9 \pm 2{\cdot}7$. The corresponding figure for the combined treatment with solbar and nosprasen was only $75{\cdot}7 \pm 2{\cdot}5$, and it is therefore concluded that the use of the former preparation is a needless expense.

Pilát (A.). **Dryodon setosum (Pers.) Bourdot et Galzin—lošák štětinatý, nebezpečný škůdce Jabloní.** [*Dryodon setosum* (Pers.) Bourdot et Galzin, a dangerous parasite of the Apple.] —*Mykologia*, Prague, iii, 5–6, pp. 73–75, 1 fig., 1926. [Received September, 1928.]

A brief morphological description is given of *Dryodon setosum* (usually known in phytopathological literature under the name *Hydnum setosum* or *H. schiedermayeri*), which has been shown to be a dangerous parasite of apple trees in France and in Switzerland. It occurs sporadically in Czecho-Slovakia, where it was found four times by various investigators, the latest record having been made in 1925 on the trunks of old apple trees. The author does not believe that under normal conditions the organism is likely to become a dangerous parasite in Czecho-Slovakia, this view being supported by the fact that in an old apple orchard the fungus was allowed to grow undisturbed as a rarity, and did not spread to the neighbouring trees although the latter were in a neglected condition. In his opinion the distribution of the fungus is ensured by fragments of infected rotted wood which are carried by the wind and lodge in crevices and hollows of old trees, rather than by the spores. In Europe, *H. setosum* has also been found on *Sorbus* [*Pyrus*] *aria*, *S.* [*P.*] *domestica*, and *Fraxinus excelsior.*

Newton (G. A.). **Some fungi of the Stemphylium type and their relation to Apple rots.**—*Phytopath.*, xviii, 7, pp. 565–578, 7 figs., 1928.

During 1925–6 species of *Alternaria, Cladosporium, Phomopsis,* and *Stemphylium* were isolated at the Washington Agricultural Experiment Station from the dark, decayed areas of several hundred apples affected by the so-called *Alternaria* rot. The various *Stemphylium* isolations were grouped in two types believed to represent species, one of which gave a *Pleospora* perfect form while the other formed no perithecia.

Two typical strains of rot-producing organisms with *Stemphylium* conidial stages were selected for investigation. One of these, *S. congestum* n. sp., produced abundant dark, muriform conidia with 1 to 3 transverse and 1 or no longitudinal septa, becoming tuberculate and black when old, and 17 to 30 by 12 to 19 μ (average 23·5 by 15.5 μ) in diameter, clustered on geniculate, septate conidiophores, but developed no perithecia; while the other, *P. mali* n. sp. [*R.A.M.*, vii, p. 363], in addition to coloured, muriform, fuscous to very dark conidia, resembling those of *S. congestum* but 21 to 36 by 12 to 24 μ (average 28·5 by 18 μ) in diameter, yielded varying numbers of perithecia, the cylindrical asci of which were 146 to 200 by 26 to 29 μ and contained eight muriform, orange to brown ascospores with 7 transverse and 1 or 2 longitudinal septa and measuring 28 to 34 by 11 to 14 μ (average 31 by 12·5 μ).

Monospore isolations were made from both strains and grown on various agar media at room temperature. Perithecia of *P. mali* (which varied from minute, imperfect forms to large fertile ones, sometimes 1 mm. in diameter) were produced on prune and cornmeal agar within a week and on the remaining media within 28 days.

The results of comparative inoculation experiments on Jonathan apples showed that *S. congestum* and *P. mali* cause less rapid rotting than *Penicillium* and *Alternaria* at temperatures of 15°, 21°, 26°, and 30°.

P. mali appears to be very closely related to *P. pomorum* Horne, isolated from spotted apples in England [ibid., iv, p. 421], but is thought to be probably distinct from *P. herbarum* var. *citrorum*, an organism which causes decay of apples and lemons in the United States [ibid., vi, p. 425].

Plagge (H. H.) & Maney (T. J.). **Soggy breakdown of Apples and its control by storage temperatures.**—*Iowa Agric. Exper. Stat. Res. Bull.* 115, pp. 61–116, 22 figs., 1928.

During 1925 and 1926 investigations on 'soggy' and 'mealy' breakdown of Grimes and other apple varieties in storage were continued [*R.A.M.*, v, p. 500].

Soggy breakdown in the Grimes and Wealthy varieties first appears about the middle of December, the most severe symptoms occurring at 30° F. The disturbance begins in the cortical region and can first be detected in cross-sections as small, light brown areas in the tissue adjoining the vascular strands. These may develop into a complete ring of soft, brown, dead tissue or, where the conditions inducing the decay are much prolonged, the entire fruit may become brown and soggy. In most cases there is a white zone of healthy flesh near the periphery of the apple and no external discoloration, but in severe attacks the surface is dull in colour. The brown tissues are soggy and watery, not mealy, and the affected fruit has a very distinctive alcoholic taste. Late in the storage period the sound tissue in the affected fruit becomes discoloured and mealy, as in the case of senescent decay. When the diseased apples are removed to higher temperatures the affected portions shrink, becoming dry and leathery. The core region is the last portion to become affected.

Mealy breakdown, also known as old age or physiological decay, internal breakdown, and senescence [ibid., vi, p. 622], is usually associated with protracted storage or with unduly high storage temperatures. Mealiness may occur without bursting and with no trace of external or internal brown discoloration. In the Grimes and Northwestern Greening varieties the core or pith region is the first affected, in contrast to soggy breakdown, while in Jonathan and some other sorts the symptoms begin nearer the skin. Mealiness very frequently paves the way for the entrance of rot fungi.

Soggy and mealy breakdown are compared and contrasted with each other and with various other types of decay. Soggy breakdown is considered to be identical with the low temperature type of internal breakdown reported by Kidd and West [ibid., iv, p. 173]. Internal browning [ibid., iii, p. 403], brown heart [ibid , iv, pp. 224, 225], freezing injury, and soft scald [ibid., vi, p. 301] are regarded as differing from either of the two storage troubles described by the authors.

Discussing the results of three years' experimental storage work at Iowa State College [full details of which are given], the writers conclude that the Grimes variety is greatly affected by temperature.

only a slight change in which may considerably influence the duration of the storage life of the apples. A temperature of 36° F. proved more suitable for storage than 30°, 32°, or 34°, the last of which, however, was considerably better than the lower degrees. Delayed storage was found materially to increase the susceptibility of the fruit to soggy breakdown.

The exposure of the fruit to free ventilation in the storage chamber prevented the development of soggy breakdown on delayed storage fruit during one season, but this practice is open to objection as causing perceptible shrivelling of the apples. Aeration in open slatted crates for one or two weeks before storing failed to control the incidence of soggy breakdown. An increased susceptibility to the disease was manifested by fruit kept at low temperatures after considerable periods of exposure (four to eight weeks) to rather high ones.

Soggy breakdown appears to be somewhat more prevalent in seasons when low moisture conditions prevail. The disease was found to occur with equal severity on Grimes apples from Wenatchee (Washington), central Michigan, and Iowa. Apples kept in commercial cold storage were observed to be just as liable to soggy breakdown as those held at the same temperature in experimental storage. An increase in the tendency to scald in Grimes which resulted from the slightly higher storage temperature used, was successfully checked by the use of oiled paper wrappers [ibid., vi, p. 622 *et passim*]. In well-graded, high quality fruit, the increase in loss due to apple rot fungi at 36° as compared with lower storage temperatures was negligible.

QUINN (G.). **'Dieback' of Apple trees.**—*Fruit World of Australasia*, xxix, 6, p. 222, 1928.

Die-back of apple trees has been observed at intervals during the past thirty years in South Australia, where the condition becomes apparent when the buds on the upper portions of the leading shoots of vigorous young trees fail to shoot with normal vigour after being pruned during the previous winter; as the season advances, they often grow into short, rosette-like spurs, while a bud or buds near the base of the previous season's growth, or lower down, in wood a year or more older, starts into active growth. No parasitic organism has been found in the affected trees, but the trouble is most severe on heavy or impervious soil, chiefly in the hotter parts of South Australia; and the writer thinks that these conditions are in some way responsible for it.

DAY (L. H.). **Pear blight control in California.**—*California Agric. Extens. Serv. Circ.* 20, 50 pp., 13 figs., 4 diags., 1928.

Full directions are given for the control of pear blight (*Bacillus amylovorus*) [of which the symptoms, life-history, and mode of infection are described] by cultural methods, the use of resistant varieties as stocks, the excision of cankers, and the application of disinfectants [*R.A.M.*, vi, p. 103; vii, pp. 383, 729]. Four general operations are recommended, namely, a winter clean-up, when any cankers found should be treated with the zinc chloride solution [instructions for the preparation of which are given]; the removal

of infected material at regular weekly intervals during the spring and summer, when all cuts and wounds should be treated with the mercury-glycerine disinfectant; the destruction of diseased branches during harvesting; and a final search for cankers in the autumn. The bulletin contains much useful information concerning the practical application of the various methods of treatment recommended.

McCubbin (W. A.). **Peach yellows report.**—*Bull. Pennsylvania Dept. of Agric.*, xi, 6, 25 pp., 6 figs., 8 graphs, 1928.

Systematic yearly orchard inspection, marking of diseased trees, and their eradication, inaugurated on an instructional basis in Pennsylvania in 1920 [*R.A.M.*, iv, p. 294] are stated to have reduced peach yellows infection from 8 per cent. in that year to 0·23 per cent. in 1927. No tree was marked by the inspectors unless it bore unmistakable evidence of the disease. As the little peach disease [loc. cit.], though considered even more injurious than yellows, was seldom encountered, the two diseases were not differentiated in the inspections.

Trees affected with yellows in Pennsylvanian orchards appear to occur in roughly circular groups, and frequently there was evidence that spread had taken place from originally diseased trees in the vicinity. It is considered that this type of spread, in a radial direction rather than along the rows, indicates that pruning, thinning, and similar operations are not responsible for transmission. Such infection groups may be found in any part of an orchard, and become more evident after the trees reach six or seven years of age. Another type of yellows group is also found in young orchards, in which a number of trees simultaneously become diseased without evidence that the infection has spread from a primarily diseased tree, but generally adjacent to some area not under cultivation and carrying natural vegetation. In nine typical instances [details of which are given] the following plants were in close proximity to the yellow groups: *Ambrosia artemisifolia* [*A. maritima*], *Asclepias syriaca*, *Chenopodium album*, *Daucus carota*, and *Phytolacca decandra.* Although these are very common in the districts in question, their constant presence in association with a particular type of outbreak is considered to indicate at least the possibility of an alternate host and of insect transmission.

Though yellows is transmissible by budding, exhaustive data compiled in 1925 on the origin of 158 young orchards, containing 157,796 trees, completely failed to show that nursery stock was responsible for spreading contagion.

Fant (G. W.). **The development of Peach sooty mold at normal and low temperatures.**—*Journ. Elisha Mitchell Sci. Soc.*, xliii, 3–4, pp. 217–219, 1928.

Inoculation experiments with a suspension in water of pure cultures on nutrient agar of the saprophytic sooty mould fungus (*Fumago vagans*), isolated from stained peach fruit and twigs in North Carolina, resulted in the production of the stain consequent on the growth of the fungus, both at laboratory temperature and also at cold storage temperatures (0° to 10° C.) [*R.A.M.*, v, p. 586].

The stain develops in a few days under the former conditions, while at lower temperatures a period of several weeks is required to produce comparable results. The staining was much more conspicuous in fruit inoculated after smearing with extracted peach juice. The organism was reisolated from the stained peaches.

GUTNER (L.). Некоторые новые сумчатые и несовершенные грибы, собранные в Ленинградской губ. [Some new ascomycetes and imperfect fungi collected in the government of Leningrad.]—*Morbi Plantarum*, xvi, 3–4, pp. 204–208, 1 pl., 1927. [Received August, 1928.]

Brief descriptions and Latin diagnoses are given of six new species of fungi collected in the neighbourhood of Leningrad. The only parasite is *Phomopsis grossulariae* n. sp., which was found on living and dying branches of gooseberry (*Ribes grossularia*). This fungus develops scattered or occasionally confluent, brownish-black, shiny, elongated pycnidia, arranged in rows and up to 1 mm. long by 150 μ broad and 75 μ high. The wall is composed of thick-walled cells, from 30 to 37·5 μ in diameter. The spores are elliptical or elongated, hyaline, continuous, with 2 or 3 oil drops, and measure 6 to 10 by 2·2 to 3 μ. The fungus differs sharply from *P. ribesia* Died. in the structure of the pycnidia.

BENNETT (C. W.). **Michigan Raspberry diseases.**—*Michigan Agric. Exper. Stat. Special Bull.* 178, 52 pp., 33 figs., 1928.

This bulletin contains much useful information, presented in popular terms, on the prevalence, symptoms, etiology, and control of the principal diseases attacking the Michigan raspberry crop, which is estimated to cover more than 10,000 acres. The red, black, and purple raspberries [*Rubus idaeus*, *R. occidentalis*, and *R. neglectus*] are all grown, Cuthbert being the chief red variety, Cumberland the chief black, and Columbian the chief purple, in cultivation in Michigan. In 1920 the yield was placed at 7,652,580 quarts valued at $1,760,100, and since that date the industry has been steadily expanding.

The following diseases are discussed. Curl, various types of mosaic, and streak [*R.A.M.*, vi, pp. 567, 675; vii, p. 36]; crown gall (*Bacterium tumefaciens*) [ibid., vi, p. 566]; anthracnose (*Plectodiscella veneta*) [ibid., vii, p. 429]; orange rust (*Gymnoconia interstitialis*) [ibid., vi, p. 40]; cane blight (*Leptosphaeria coniothyrium*) [ibid., vi, p. 739]; spur blight (*Mycosphaerella rubina*) [loc. cit.]; powdery mildew (*Sphaerotheca humuli*) [ibid., vii, p. 727]; and leaf spot (*M. rubi*) [ibid., vi, p. 566].

Notes are also given on various disorders of physiological origin and on the particular diseases to which each of the chief varieties is most susceptible, instructions for the control of which are given.

O'BRIEN (D. G.) & M'NAUGHTON (E. J.). **Disease in Strawberries.**—*Scottish Journ. of Agric.*, xi, 3, pp. 286–297, 6 figs., 1928.

This is a summary of the authors' paper on the Lanarkshire disease of strawberries recently noticed from another source [*R.A.M.*, vii, p. 524].

SERRANO (F. B.). **Bacterial fruitlet brown-rot of Pineapple in the Philippines.**—*Philipp. Journ. of Sci.*, xxxvi, 3, pp. 271–305, 19 pl. (2 col.), 1 graph, 1928.

In June, 1924, the writer first observed a bacterial disease of pineapple fruitlets in the Philippines, where it is fairly widely distributed. The average percentage of infected fruit from four districts was 42·4, while the smooth Cayenne variety (on which the disease chiefly occurs) from one district showed 54·4 per cent. infection, of which 17 per cent. was a total loss.

The following are the chief symptoms of the disease, which is believed to be identical with that reported by Barker from Haiti [*R.A.M.*, v, p. 618], and which also resembles in many ways the fruitlet core-rot described by Tryon (in the *Queensland Agric. Journ.*) in 1898. Slight to moderate infections are imperceptible externally, but in severe cases the fruits are abnormally hard and show a dull ripening colour in which are usually minute, purplish-black dots. One or more of the fruitlets may show a brown discoloration of varying shades, which in advanced cases extends to the fibro-vascular bundles of the core. The infected tissues are dry and filled with masses of a primuline-yellow bacterium, *Erwinia* (or *Bacillus*) *ananas* n.sp. [the morphological and cultural characters and numerous physiological reactions of which are described].

The organism is rod-shaped, with rounded ends, measuring 0·9 by 0·6 μ, occurring singly or in pairs (occasionally in chains); motile by means of 4 to 8 peritrichous flagella; encapsuled and sometimes grouped in clumps; non-spore-forming, Gram-negative, non-acid-fast, and staining readily with carbol fuchsin, gentian violet, and methyl violet. The index number of this organism, according to the Chart of the Society of American Bacteriologists, is 5311–32125–1222.

A copious yellow growth is produced on natural and artificial media, especially those containing sugar. The organism developed over a temperature range of 6° to 45° C. with an optimum at 30° to 35°. The best growth was made at reactions of +10 to +20 (Fuller's scale), with a maximum and minimum at +30 and −20, respectively, the optimum being about +15. Extreme resistance was shown to desiccation. Mercuric chloride (1 : 1,000,000) proved more toxic to the bacterium than copper sulphate or lime-sulphur solutions. A pearl-grey to deep greenish-blue strain, the stability of which entitles it, in the author's opinion, to be designated as a true mutant, was occasionally isolated from potato-glucose agar cultures at +10.

The results of inoculation experiments [which are described] proved that both the yellow bacterium and the grey mutant can reproduce the fruitlet brown rot when introduced through needle punctures. The incubation period was found to range from 15 to 30 days. The constant association of a species of *Penicillium* with the bacterial lesions is thought to increase the damage. The bacterium was shown to be capable of producing red streaks, similar to those associated with various obscure diseases, in punctured sugar-canes. It is possible, therefore, that sugar-cane may harbour the pathogen under favourable environmental conditions.

The disease, which is most active during warm weather and on large, succulent fruits, is spread by wind, dashing rain, infected fruits left to rot in the soil, and the use of slips, crowns, and suckers from diseased plantations, as well as by various insects.

GOODWIN (W.) & MARTIN (H.). **Bordeaux mixture in combination with arsenical sprays.**—*Journ. Agric. Sci.*, xviii, 3, pp. 460–477, 1928.

Continuing their investigations on mixed sprays [*R.A.M.*, vi, p. 109] the authors conducted experiments [which are described in full and the results tabulated] in which the interaction of Bordeaux mixture with lead arsenate and with calcium arsenate was studied by examining the effects produced (*a*) when hydrated lime was added to the arsenical compounds, and (*b*) when copper sulphate was added to the arsenical compounds and hydrated lime.

The interaction between calcium hydroxide and diplumbic hydrogen arsenate, $PbHAsO_4$ (the main constituent of commercial lead arsenate pastes and powders in England), was shown to be highly complex and to result in the complete decomposition of part of the lead arsenate and in the formation of basic calcium arsenates. The lead present in solution appears to be as a calcium plumbite and is not as lead bicarbonate. Support is not given to the view that calcium carbonate decomposes diplumbic hydrogen arsenate with the production of soluble arsenic compounds, the results reported by Ginsburg [ibid., vii, p. 105] being ascribed by the authors to the presence of free lime in the kayso or calcium carbonate used in his experiments. When the lead arsenate, in water, was allowed to interact over long periods with excess of hydrated lime, it seems probable that by some undetermined initial reaction a certain amount of the lead arsenate was decomposed, giving rise to soluble arsenic which was precipitated by the excess of calcium hydroxide as basic calcium arsenates. The amount of basic calcium arsenates formed was such that large quantities of arsenic were brought into solution by the action of carbon dioxide. Under conditions such that the hydroxide was rapidly converted to the carbonate (as occurs, for instance, after spraying on a leaf) only a slight amount of arsenic was rendered soluble.

When copper sulphate was added to the lead arsenate-calcium hydroxide mixture, soluble arsenic was either prevented from forming or, if formed, was made to disappear. When calcium arsenate was used instead of lead arsenate, the addition of copper sulphate caused an enormous reduction in the amount of soluble arsenic formed.

The authors conclude that when hydrated lime is added to lead arsenate and to calcium arsenate the risk of arsenical injury in spraying is definitely reduced; also, if instead of lime an 'equal lime' Bordeaux mixture, containing an equivalent amount of lime, is used, such a mixture is far more effective as a 'corrective' than hydrated lime.

Bodnár (J.), Róth (Lili E.), & Tergina (Irène). **Einfache und schnelle analytische Methode zur Bestimmung des Wirkungssubstanzgehaltes von Pflanzenschutzmitteln. IV. Mitteilung. Die titrimetrische Bestimmung des Quecksilbers in Saatgutbeizmitteln.** [Simple and rapid analytical method for the determination of the content of the active principle in plant protectives. Note IV. The titrimetric determination of mercury in seed disinfectants.]—*Zeitschr. Analyt. Chemie*, lxxiv, 3–4, pp. 81–105, 1928.

Modern seed disinfectants frequently contain organic mercury compounds, and sometimes have, in addition, copper and arsenic (tillantin) or copper alone (higosan). The authors describe a simple and rapid colorimetric method of titration for the determination of the mercury content after conversion into inorganic compounds with mineral acids.

The data obtained in the analyses [presented in tabular form] indicate that approximately comparable results are given by the gravimetric and titrimetric methods, as well as by distillation. The percentages of mercury contained in some standard preparations tested by the authors' method were as follows: germisan 15·43, tillantin C 4·02, tillantin liquid [uspulun-universal] 3·27, tutan 6·58, uspulun 17·17, abavit B 6·74, agfa 13·87, agfa dust 3·45, higosan (two lots) 13·96 and 13·86, kalimat B 1·96, roggenfusariol 43·51, sublimoform 13·54, urania 5·61, and weizenfusariol (two lots) 12·39 and 11·88.

Soriano (S.). **Notas micológicas sobre el cultivo en medios artificiales de algunos hongos parásitos de plantas.** [Mycological notes on the cultivation in artificial media of some fungi parasitic on plants.]—*Rev. Fac. Agron. y Vet.*, Buenos Aires, Ser. II, vi, pp. 89–114, 10 pl., 10 figs., 1928.

The cultural characters of the following Argentinian fungi are described: *Phlyctaena* (?) *linicola*, the causal organism of the 'pasmo' disease of flax [*R.A.M.*, v, p. 366], which the author successfully reproduced by inoculation from pure cultures; *Septoria lycopersici*, which constitutes one of the chief obstacles to the cultivation of tomatoes in the neighbourhood of Buenos Aires and which was also successfully reproduced by inoculation; *Ustilago zeae*, the causal organism of maize smut; *Colletotrichum lindemuthianum*, which is responsible for the serious anthracnose disease of beans; *S. petroselini* and *S. petroselini* var. *apii* [*S. apii*], attacking parsley and celery, respectively; *S. lactucae*, which causes a leaf spot of lettuce, hitherto of slight importance; *Sclerotinia cinerea*, causing heavy damage to peaches; *Cercospora beticola* on beets; and the *Sphacelia* stage of *Claviceps deliquescens* (which is thought to be probably a synonym of *C. paspali*: *Journ. Agric. Res.*, vii, p. 401, 1916), infecting the ears of *Paspalum dilatatum*.

In each case the cultures are carefully described and their macroscopic characters are clearly illustrated.

Morstatt (H.). **Ernteschäden durch Pflanzenkrankheiten.** [Harvest reductions through plant diseases.]—*Umschau*, xxxii, 21, pp. 413–414, 1928.

The following are stated to be the estimated figures for the

annual reductions in the yield of the principal German crops as a result of plant diseases: cereals, 10 per cent., representing a value of M. 394,000,000; potatoes, 25 per cent. (M. 365,000,000); sugar beets, 5 per cent. (M. 12,000,000); vegetables, 10 per cent. (M. 35,000,000); fruit, 10 per cent. (M. 40,000,000); and vine, 20 per cent. (M. 16,000,000). The average total amount of the reduction consequent on plant diseases is 10·8 per cent., as compared with 7·8 per cent., for insect pests, while the financial loss from both sources together is placed at approximately M. 2,000,000,000.

KLEBAHN (H.). **Experimentelle und cytologische Untersuchungen im Anschluss an Alloiophyllie und Viruskrankheiten.** [Experimental and cytological investigations in connexion with alloiophylly and virus diseases.]—*Planta, Arch. wissensch. Bot.*, vi, 1, pp. 40–95, 70 figs., 1928.

Continuing his investigations on alloiophylly in *Anemone nemorosa* [*R.A.M.*, v, p. 753], the author found that this condition is transmissible by inoculation to *A. ranunculoides* and *A. trifolia*.

The so-called 'scolecosomes' occur in healthy anemones and in various species not known to suffer from alloiophylly, as well as in diseased individuals: these structures, therefore, cannot be considered to play any part in the etiology of the condition.

The 'elongated needle-like crystals or raphides' and 'striated material' described by Miss Goldstein in mosaic tobacco [ibid., vi, p. 261] were also observed by the author on material of the same host; the former occurred in all, and the latter in nearly all, the tissues. These structures, which are absent in healthy plants, are regarded as an albuminous metabolic product of the diseased individuals. The significance of the X bodies [loc. cit.] and of the so-called 'miculae' (minute spherical, elongated, or irregular grains, 2 μ in diameter, found by the writer in the mesophyll cells of young mosaic tobacco leaves) is regarded as uncertain. The same applies to the oval or elongated ooplasts (4 to 7 μ long and less than 1 μ in thickness) occurring in certain phloem cells of both healthy and diseased tobacco.

In the phloem of *Abutilon thompsoni* showing the well-known infectious type of chlorosis [ibid., vii, p. 385], the writer detected the presence of corkscrew-shaped bodies resembling trypanosomes, which he names 'trypanoplasts'. These structures, however, cannot be the cause of chlorosis in this host, since they occur also in the normal green variety *A. striatum*. Similar trypanoplasts and ooplasts, as well as transitional stages between the two, were found in the phloem of mosaic potatoes, but as they also occur in healthy material, they cannot be considered as a cause of the disease. The phloem (and occasionally also the epidermal and subepidermal cells) of potatoes affected by mosaic and intercostal mosaic contains raphides and spindles similar to those described in tobacco: these bodies were not found in healthy plants or in those suffering from crinkle and aucuba mosaic.

The raphides and spindles characteristic of mosaic tobacco and potato are regarded as analogous to the 'albumin bodies' reported by various workers as occurring normally in different hosts. The scolecosomes of *A. nemorosa* are, perhaps, of a similar nature, though further investigations are required to establish their identity.

Bodies corresponding to the above-mentioned ooplasts were also observed in the leaves of mosaic tomato (dimensions 16 by 3·5 μ) and beet (9 by 2 μ), the latter phenomenon having already been described by Schaffnit and Weber [ibid., vii, p. 108].

The 'mastigoplasts' (Strasburger's 'slime clumps') [ibid., ii, p. 515], occurring in the sieve-tubes of *Robinia pseud-acacia* and other Papilionaceae, are distinguished from all the foregoing cell-inclusions by conspicuous flagella and by their peculiar relations to the sieve-plates.

Filtration experiments through collodion membranes with tobacco mosaic [which are fully described] indicate that the particles of the virus do not exceed 40 $\mu\mu$ [ibid., iii, p. 357]. Extensive inoculation experiments carried out by the writer have confirmed the view that the agent of tobacco mosaic is an ultra-microscopic body, the exact nature of which remains to be determined. The filtered sap, at first light brown, darkens later owing to the oxidizing action of an orthodioxybenzol compound: it contains traces of an albuminous substance. The sediment contains calcium citrate.

The results of preliminary experiments indicate that alloiophylly of anemones is a transmissible disease caused by an ultra-microscopic virus, but further work is essential to the confirmation of this hypothesis.

DEMETER (K. J.). **Bakteriophagie und Landwirtschaft.** [Bacteriophagy and agriculture.]—*Fortschr. der Landw.*, iii, 9, pp. 394–399, 1928.

This is a very brief general review of the phenomenon of bacteriophagy as interpreted by various investigators [whose work is briefly summarized]. Emphasis is laid on the possibilities of applying the process in veterinary medicine, dairy work, agriculture, and phytopathology. D'Hérelle's observations on lysis in Shiga's bacillus are thought to furnish an analogy with the present writer's 'plasmoptysis mycorrhiza' [*R.A.M.*, iii, p. 413].

MASON (EDNA). **Note on the presence of mycorrhiza in the roots of salt marsh plants.**—*New Phytologist*, xxvii, 3, pp. 193–195, 3 figs., 1928.

Endotrophic mycorrhiza have been observed, apparently for the first time, in the roots of *Plantago coronopus*, *P. maritima*, *Aster tripolium*, *Glaux maritima*, *Armeria maritima*, *Cochlearia officinalis*, *Agrostis alba*, and *Glyceria maritima* growing in the wet soil of salt marshes. Hyphae occurred in the cortical cells, the mycelium generally consisting of branched systems of non-septate hyphae, 2 to 9 μ wide, sometimes lobed and of irregular contour. At intervals characteristic compound arbuscules were generally formed. Vesicles similar to those figured by Peyronel in wheat [*R.A.M.*, ii, p. 172] were found on the non-septate hyphae. Vacuolated cytoplasm and many nuclei were found in these in material collected in July and August, but the spore stage was not represented. In *Glyceria maritima* the roots contained both non-septate and septate, branching, intracellular hyphae. Septate hyphae were also observed in *A. maritima* and *Agrostis alba*.

KOŘÍNEK (J.). **Ein Beitrag zur Kenntnis der Psychotria-Symbiose.** [A contribution to the knowledge of *Psychotria* symbiosis.]—*Centralbl. für Bakt.*, Ab. 2, lxxv, 1–7, pp. 52–54, 1928.

It was found impossible to effect any morphological or physiological change in the bacterial symbionts in cut leaves of the Rubiaceous plant, *Psychotria bacteriophila* [*R.A.M.*, iii, p. 572]. However much the plant tissues may be weakened, the bacteria are unable to parasitize them once fully established, although in the first instance they act as parasites, penetrating the leaves and destroying certain cells. Furthermore, they are incapable of assuming a saprophytic mode of existence on the death of the host, but appear to die simultaneously and to become absorbed. In any case, the *Psychotria* symbiosis cannot be regarded as a well-adjusted form of parasitism, in which each partner can profit by the lowered vitality of the other.

HURSH (C. R.). **The reaction of plant stems to fungous products.**—*Phytopath.*, xviii, 7, pp. 603–610, 1 fig., 1928.

The disintegration of tissue disks is stated to serve as a more useful criterion of the injury inflicted on plant tissues by a fungous filtrate than the production of wilting [*R.A.M.*, v, p. 49]. The age and condition of the stems greatly influence their wilting response when placed in culture filtrates, rapidly growing, succulent stems succumbing more quickly than older and harder ones. This was illustrated by an experiment in which cut Stone tomato stems were placed in sterile filtrates of three-weeks-old cultures of *Aspergillus niger*, *Fusarium lycopersici*, and *Verticillium albo-atrum* on a modified Richards's solution. Wilting was found to occur within twelve hours in the growing, succulent stems, while mature ones showed only a vascular discoloration towards the cut end.

It is evident from the collapse of the basal cells of the young stems that the culture filtrates contain substances injurious to the plant cells, which in mature plants may, perhaps, be inactivated before they reach the leaves. These substances also cause discoloration of the vascular system and interference with the transpiration stream. Besides the rapid type of wilting, a more gradual type, accompanied by yellowing and vascular discoloration, is frequent in woody stems.

Some of the injurious substances are carried through the stem and kill small, irregular patches of leaf tissue with little injury to the rest of the plant: others blacken the leaf veins and sometimes also cause wilting of the entire stem. Many necrotic conditions of plant tissue induced in the laboratory by products isolated from culture filtrates have no direct analogy with pathological conditions as observed in the field.

The frequent recovery of plants affected by the temporary wilting caused by *Fusarium* and *Verticillium* spp. indicates that the condition is due to some interference with the water-absorbing and water-conducting system, rather than to the actual poisoning of the upper leaves by fungous products. In the *Botrytis* wilt of peony [*B. paeoniae*: ibid., vi, p. 668] the author's experiments proved that the wilting was due to a purely local blocking of the vessels, as wilted stems cut off just above the infected basal portion and

placed in water recovered turgidity and maintained it as long as the controls.

When the stem at the point of attack reaches an advanced stage of distintegration, the products of the dead cells may be equally responsible with the fungous products for the pathological condition of the upper stem.

PELLUET (Miss D.). **Observations on the cytoplasm of normal and pathological plant cells: the effect of parasitism on the chondriome of certain members of the Ericaceae, with a brief description of their ecology.**—*Ann. of Botany*, xlii, 167, pp. 637–664, 2 pl., 3 figs., 2 diags., 1928.

A cytological examination, with special reference to the mitochondria, was made of pea seedlings grown under abnormal conditions in order to ascertain whether the induced pathological changes were reflected in the cytoplasmic constitution of the cells. In all cases, however, negative results were obtained, no appreciable difference being observed between the cytoplasm of the control plants and those grown in solutions devoid of calcium, potassium, and phosphorus. It is thought that the indirect influence of these environmental modifications is overcome by the reserve material in the seedlings, which enables them to withstand such changes for a longer period than that covered by the growth of the experimental material. To produce observable alteration in the mitochondria and other bodies, a direct attack on the cells is apparently necessary and the author accordingly studied the effect produced by fungous parasites.

An investigation of the cytoplasmic inclusions in the leaves of two members of the Ericaceae, viz., huckleberry (*Gaylussacia dumosa*) and cranberry (*Vaccinium macrocarpon*) from Nantucket Island, Massachusetts, was made from healthy plants and from plants infected by *Exobasidium oxycocci* [*R.A.M.*, vi, p. 303].

The normal leaves of the plants under observation contain large plastids, the staining reaction of which shows their undoubted lipoidal character. The inclusions in the epidermal cells are typical mitochondria, while those of the palisade and mesophyll tissues are very variable in shape, size, and staining reaction. The structure of the plastids is not homogeneous, but is composed of granules in process of ejection into the surrounding cytoplasm. The enzymatic nature of these plastids suggests that they play an active part in the metabolism of the cell.

E. oxycocci also contains mitochondria in the cytoplasm of its mycelium. The hyphae penetrate between and below only the epidermal cells of the host plant, though frequently one may indent the cellulose wall and then penetrate into the interior of the cell. The chlorophyll of the leaves disappears completely under the action of the fungus, and the infected parts are characterized by a vivid pink colour; this symptom, together with the increased size of the leaves and their close arrangement, has suggested the popular name of 'false blossom' [loc. cit.]. The most striking anatomical change in the diseased foliage is the reversion of the differentiated tissues to a uniform type of parenchymatous cell. All traces of a distinction between palisade and mesophyll layers are found to have dis-

appeared, while the aerating system is entirely obliterated, there being no intercellular spaces and the stomata being represented, if at all, only by gaps filled with hyphae bearing basidia. The result of hyphal infection of the cells is not an apparently simple osmotic interchange with accompanying plasmolysis, the infected cells in the early stages being rather in a state of turgescence. In extreme cases the total disappearance of all lipoidal material in the host cell is observed. It is suggested that the fungus excretes a lipase which causes the separation of the lipoid granules into their fatty acid constituents, thereby rendering them available for absorption by the hyphae. The material in the plastids is of a phospholipoid nature and thus the hydrolysis would liberate the phosphorus necessary for fungal development.

HADFIELD (J. W.) & CLARIDGE (J. H.). **Certification of seed Potatoes.**—*New Zealand Journ. of Agric.*, xxxvii, 1, pp. 8–18, 9 figs., 1 graph, 1928.

In this paper the results are given of the first season's work, in 1927–8, in the certification of seed-potatoes at Canterbury, New Zealand [*R.A.M.*, vii, p. 736].

The seed was set in October, 1927, and two months later it was found that out of 3,300 plants 18·8 per cent. were seriously retarded in growth owing to infection from *Corticium solani*, infection in the different lines ranging from 5 to 44 per cent.

At the first field inspection, in January–February, 1928, early wilt infection amounted to 1·5 per cent., and was taken into account in certification; at the second inspection, in April, approximately 29·7 of the plants were affected with a late type of wilt which did not appreciably affect the yield and was disregarded.

Evidence was obtained that certain of the lines of potato now grown are severely affected by virus diseases, of which leaf roll and mosaic are stated to cause serious reductions in the yield.

THUNG (T. H.). **Over knolentingen, die ter bestudeering der virusziekten van de Aardappelplant worden uitgevoerd.** [On tuber grafts carried out for the study of the virus diseases of the Potato plant.]—*Tijdschr. over Plantenziekten*, xxxiv, 7, pp. 195–199, 2 diags., 1928. [French summary.]

The results of a series of grafting experiments with potato tubers, conducted according to Quanjer's method (*Meded. Landbouwhoogeschool*, xvii, p. 1, 1920) in 1926 and 1927, showed that union of the two parts into an organic whole is not essential for the transmission of the virus of mosaic, aucuba mosaic, leaf roll, and crinkle from the diseased to the healthy individual. Crinkle and mosaic were transmitted from Bravo to Schotsche Muis [Midlothian Early] tubers simply by rubbing the diseased half of the former on to the healthy cut surface of the latter. These two diseases, as well as aucuba and leaf roll (which were less readily transmissible), were also conveyed from infected to healthy tubers by grafting cut halves of the former on to the latter, even when the two halves were again separated from one another after four weeks. The Bintje and Eigenheimer varieties were more difficult to infect than those men-

tioned above. It is concluded that the virus is carried from the cut surface of the tuber to the young leaves with the nutrient substances absorbed by the shoots, i. e., that there is no autonomous movement of the infective material within the plant [cf. *R.A.M.*, vii. p. 659]. Streak was found to present entirely different characteristics from the four diseases mentioned above, and was not amenable to these methods of transmission.

ŘIHA (J.). **Jest mosaiková choroba Bramborů stejně škodlivá jako svinutka?** [Is the mosaic disease of Potatoes as injurious as leaf roll?]—*Zemědělský Archiv*, Prague, xix, 3–4, pp. 134–140, 1 pl., 2 figs., 1 graph, 1928.

The author states that under the ecological conditions prevalent in the Czecho-Moravian highlands, the mosaic disease of potatoes does little damage and hardly affects the yield; in a test made in 1926 with seed from a heavily infected crop, the reduction in the yield only amounted to about 12 per cent. Leaf roll, on the other hand, often attains a high degree of severity, and is responsible for losses ranging from about 70 to 88 per cent. [cf. *R.A.M.*, vii, p. 667]. Both diseases reduce the starch contents of the tubers, but whereas the reduction in the case of advanced leaf roll may be as high as 4·4 per cent. (from 19·34 to 14·94 per cent. in the Model variety), mosaic only reduced the starch by 0·51 per cent. (from 18·49 to 17·98) in the Vaclavky variety. It is pointed out, however, that this relatively greater economic importance of leaf roll does not apply to other parts of Czecho-Slovakia, where all types of the so-called degeneration diseases of the potato are much more prevalent. Reference is also made to a series of experiments in which the author succeeded within three years in eliminating leaf roll almost entirely from a heavily infected selection of varieties by strict roguing of the crop, while in a parallel series of experiments with mosaic he not only failed to obtain the same results, but the incidence of mosaic appeared to increase in the successive generations.

COSTANTIN [J.]. **Troisième culture de Pommes de terre d'origine montagnarde.** [Third planting of Potatoes of mountain origin.] —*Comptes rendus Acad. d'Agric. de France*, xiv, 24, pp. 825–828, 1928.

In support of his theory that degeneration in potatoes can be combated to some extent by cultivation at high altitudes [*R.A.M.*, vi, p. 434], the writer cites statistics showing that the yield of Wohltmann and Institut de Beauvais potatoes procured from Pralognan, Savoy (1,400 m. above sea-level) was not diminished during three years' cultivation (1925 to 1927) in the plain. On the contrary, the high productivity characteristic of the tubers of mountain origin has persisted under the different conditions of cultivation, and was especially remarkable in 1927.

ESMARCH (F.). **Die Schwarzbeinigkeit der Kartoffeln.** [Blackleg of Potatoes.]—*Die Kranke Pflanze*, v, 7, pp. 108–109, 1928.

This is a popular description of the symptoms and etiology of potato blackleg (*Bacillus phytophthorus*) [*B. atrosepticus*], with

indications for its control by cultural measures and the use of late, thick-skinned varieties, e. g., Daber.

PONSARD (J.). **La jambe noire de la Pomme de terre.** [Potato blackleg.]—*Journ. d'Agric. Prat.*, xcii, 30, p. 74, 1 col. pl., 1928.

Brief, popular notes are given on the occurrence in France of potato blackleg (*Bacillus atrosepticus*), which is stated to have caused very severe damage to the Ursus variety at the Grignon experimental farm during 1928. No means of control are known, but the incidence of infection may be diminished by the use of healthy seed-potatoes, planting whole tubers, extended periods of crop rotation, and the immediate destruction of diseased material.

ABBOTT (E. V.). **La 'roña' y la 'rancha' o 'hielo' de la Papa.** ['Scab' and 'rot' or 'blight' of the Potato.]—*Estac. Exper. Agric. Soc. Nac. Agrar., Lima (Peru), Circ.* 7, 11 pp., 4 pl. (3 col.), 1928.

Hitherto the writer has observed the occurrence of powdery scab of potatoes (*Spongospora subterranea*) only in the Arequipa and Cuzco valleys of Peru, but it is probably present also in other parts of the Sierra, where the conditions for its development are ideal. Brief popular notes are given on the symptoms of the disease, the life-history of the causal organism, and its control by seed selection and treatment with formalin or corrosive sublimate, soil disinfection with flowers of sulphur at the rate of 900 lb. per acre (not yet tested in Peru but reported to be successful in Maine), and at least three years' crop rotation.

Similar notes are given on late blight (*Phytophthora infestans*), which is known to occur in Rímac, Oxapampa, Arequipa, and Cuzco, with recommendations for its control by spraying with Bordeaux mixture (4–4–50 for the first application and 6–6–50 thereafter).

BRYAN (H.). **Wart disease infection tests.**—*Journ. Agric. Sci.*, xviii, 3, pp. 507–514, 4 figs., 1928.

Details are given of the tests conducted at Ormskirk during 1927–8 with a simplified form of Miss Glynne's indoor method for ascertaining the susceptibility of potato varieties to wart disease [*Synchytrium endobioticum*: *R.A.M.*, iv, p. 501]. It consists in infecting the clean growing sprouts by summer sporangia. The tubers, contained in wire trays enclosed in shallow wooden boxes with glass lids, and having pieces of fresh, developing wart pinned to the eyes, are placed rose-end upwards on damp, thin flannel, are sprayed with water once daily, and are covered with flannel, which is kept moist.

Success depends on maintaining a film of moisture between the young shoots and the attached wart, on using sound, slightly sprouted tubers (with sprouts not more than one-eighth inch long), on the careful pinning on of the fresh wart, and its removal when rotten, and on the avoidance of too high a temperature and excess of water. In the work described, the greenhouse temperature

averaged 15° C. during the day, but sometimes fell to 5° in the early morning. After April, artificial heating was discontinued.

Numerous known susceptible tubers were so tested in 1928 and, except for isolated rotting, infection was invariable; all the tubers bore typical wart excrescences within 28 days from the beginning of the treatment, and 90 per cent. within 21 days. Infection was occasionally detected within 10 days. When infection appeared, the tubers were removed from the boxes and buried in moist sand to hasten wart development. Large growths similar to those found in July and August on susceptible varieties growing in infected land were obtained during winter within four or five weeks of the inception of the test.

Eighty-two seedlings from two commercial firms were tested by this method, and the susceptibility of 33 stocks was established within 28 days. All the 135 tubers tested were subsequently fit for planting, no rotting having occurred.

The reaction to wart of 103 out of 110 numbered samples, each of two or three tubers of different varieties of established immunity or susceptibility and the identity of which was known only by the sender (the Director of the Potato Virus Research Station, Cambridge), was correctly ascertained within 24 days. On the identity of the samples being disclosed it was found that 31 established immune and 18 susceptible varieties were represented.

The advantages of indoor testing are that it can be carried out with as few as three tubers, the results are forthcoming in three or four weeks, and it can be conducted in any season. Numerous varieties can be tested in a small space, optimum conditions can be maintained in any weather, and the breeder is enabled to discard susceptible seedlings promptly.

LINDFORS (T.). **Bekämpa Potatisbladmöglet genom besprutning!** [Control Potato blight by spraying.]—*Landtmannen*, xi, 24, pp. 491–493, 1 fig., 1928.

Full directions are given for the control of potato blight [*Phytophthora infestans*] by one or more applications of 2 per cent. Bordeaux mixture [*R.A.M.*, vi, p. 250]. Except in seasons highly favourable to the development of the fungus, one application generally suffices in the central and northern districts of Sweden, whereas it is advisable to spray twice in the south. The average annual increase of yield from spraying in Sweden during the period 1911 to 1923 is estimated at 13 per cent., or 2,340 kg. (representing a monetary value of Kr. 117) per hect. Calculating the average cost of the treatment at Kr. 49 per hect., the net gain thus realized is Kr. 68. The Nilob spraying apparatus is reported to have given satisfactory results in recent State experiments.

ASHPLANT (H.). **Reports of Rubber Specialist. Extract from Report of Rubber Specialist for May–June, 1928. Brown bast. Startling new facts.**—*Planters' Chron.*, xxiii, 28, pp. 518–519, 1928.

The author states that a correlation has been established between the percentage amounts of brown bast infection developed by *Hevea* rubber trees and the number of latex rings that they show. Thus,

during three years' tapping, infection was found to increase progressively with the number of rings, ranging from 8 per cent. in trees with a few latex rings, and 20 per cent. in those with about the average number, to 50 per cent. in those showing twice the average number of rings, while trees having the highest number of latex rings showed 67 per cent. brown bast. Further investigations are in progress.

JOHNSON (M. O.). **Control of chlorosis of the Pineapple and other plants.**—*Indus. & Engin. Chem.*, xx, 7, pp. 724–725, 1928.

Chlorosis of pineapples in Hawaii [*R.A.M.*, iii, p. 743] differs from most similar conditions in its occurrence on acid soils containing no calcium carbonate and a low to moderate amount of lime. Two factors have been found to affect the availability of iron in the soil, viz., the relative acidity or alkalinity of the soil, and the relative oxidizing or reducing agents therein. In soils with a hydrogen-ion concentration exceeding P_H 4·5, ferric iron appears largely unavailable to plants susceptible to chlorosis, and the chief source of iron supply seems to be ferrous salts. The manganese dioxide present in the Hawaiian pineapple soils evidently renders the iron unavailable, although such soils may contain up to 25 per cent. ferric oxide. Heavy applications of sulphur and as much as 3,000 lb. iron sulphate per acre in the soil at planting time proved ineffectual in the prevention of chlorosis, while practically complete control was given by monthly sprayings with iron sulphate at the rate of 10 lb. of the sulphate per acre.

Since 1919 an attempt has been in progress to replace the spraying method by iron sulphide dusts. Precipitated ferrous sulphide proved too expensive, and ordinary pyrites did not oxidize rapidly enough. In 1923, however, it was found that some samples of marcasite, chemically identical with iron pyrites but crystallized in the rhombic instead of the isometric system, oxidized rapidly on exposure. A supply of marcasite was obtained from the Bethlehem Steel Company and applied to the leaves of the plants at the rate about 8 lb. per acre every two months. In order to distribute this small quantity of powdered marcasite, it was mixed with about one-third its weight of infusorial earth. This method proved fairly successful, but it is considered doubtful whether any such treatment will form an effective substitute for spraying.

Very satisfactory results were also obtained by the application of marcasite dust to the leaves or leaf axils of chlorotic sugar-canes in some highly calcareous Hawaiian soils.

KOFFMAN (M.). **Eine Methode zur direkten Untersuchung der Mikrofauna und der Mikroflora des Bodens.** [A method for the direct examination of the microfauna and microflora of the soil.]—*Centralbl. für Bakt.*, Ab. 2, lxxv, 1–7, pp. 28–45, 2 pl., 1 fig., 8 diags., 1928.

The principal features of a new method [which is fully explained] for the direct examination of soil micro-organisms are as follows: the use of special types of microscope slides in which are excavated depressions varying in shape according to the purpose they have to serve; preparation of uniform emulsions of the soil samples;

even distribution of the emulsion over a given surface; and special fixing and staining processes. These are claimed to secure a more accurate qualitative and quantitative determination of the various micro-organisms represented in the samples than are usually obtained.

WERNECK (H. L.). **Der falsche Meltau des Hopfens in Oberösterreich.** [Downy mildew of Hops in Upper Austria.]—*Wiener Landw. Zeit.*, lxxviii, 30, p. 255, 1928.

The occurrence of downy mildew of hops [*Pseudoperonospora humuli*] has recently been reported for the first time from two localities in Upper Austria.

STANER [P.]. **Les maladies du Vanillier à Eala.** [The diseases of Vanilla at Eala.]—*Bull. Agric. Congo Belge*, xix, 1, pp. 85–90, 8 figs., 1928.

The following diseases have been observed to occur on *Vanilla planifolia* in the equatorial regions of the Belgian Congo. Anthracnose, caused by a fungus described by Massee as *Calospora vanillae* and by Miss Stoneman as *Gnomoniopsis vanillae* [*Botryosphaeria vanillae*: *R.A.M.*, vi, p. 694; vii, p. 201]; the conidial stage of this organism is referred to *Cytospora vanillae.* Some plants affected by this disease showed a yellow (later brown to grey) discoloration of the foliage associated with the presence of a species of *Colletotrichum* (? *C. vanillae* Scalia, of which *Vermicularia vanillae* Delacr. is stated to be the young stage), with setae measuring 71 to 100 by 3·5 μ and conidia 11 to 12 by 3 to 4 μ, and of a *Gloeosporium* with minute, spherical conidia 1·6 to 2·5 μ in diameter. A species of *Helminthosporium*, with conidia measuring 20 by 5 to 7 μ, sometimes appears on the decayed portions of the tip of the shoot. Very good control of this disease has been obtained by spraying with Bordeaux mixture.

A species of *Colletotrichum*, differing from that mentioned above in its saprophytic character, as well as in its dimensions and the location of the acervuli, occurs on dead vanilla leaves. The very dark-coloured setae measure 185 to 200 by 4 to 5 μ, the acervuli are about 135 μ in width, and the falcate, hyaline, unicellular conidia measure 18·5 to 21 by 2·8 μ.

A light brown (later black) spotting of the leaves, causing the death of the affected parts, is stated to be due to *Nectria bogoriensis* Bern. or *N. vanillae* Zimm. This fungus is characterized by fusoid, bicellular, hyaline, obliquely uniseriate ascospores, measuring 23 to 24 by 7 to 8·5 μ, while the asci are 70 to 75 by 16 μ.

A species of *Fusarium* with fusoid, hyaline, pluricellular conidia, measuring 35 to 40 by 2·8 μ, occurs on the dry tissues of dead plants, the stems of which may also show the presence of a *Stilbum* characterized by hyaline, unicellular conidia, measuring 2·8 to 4·2 by 1·4 μ, borne on the apices of reddish stalks on unbranched conidiophores.

An alga, *Cephaleuros henningsii*, a species quite distinct from *C. virescens* [*C. mycoidea*], produces glaucous green spots, up to 2 cm. in diameter, on the leaves.

All these diseases may be controlled by suitable cultural

measures, including the application to the soil of phosphates and potassium.

KELLY (N. L.) & WILSON (G.). **Cane pests and diseases.**—*Queensland Agric. Journ.*, xxix, 4, pp. 272–275, 1928.

In the Cairns and Gordonvale area of Queensland, gumming disease of sugar-cane [*Bacterium vascularum*], though present only on one farm in February, 1928, had spread from the first ratoon H. 109 to the B. 147 adjoining. It is regarded as potentially the most dangerous disease locally present. Top rot [*R.A.M.*, ii, p. 581; vi, p. 54] was more prevalent than in any previous season, and was widespread on N.G. 15 in several areas.

In the Babinda district, leaf scald [*Bact.* sp.] was found in every section visited. Near Mount Bauple an alarming amount of secondary infection by mosaic was observed on cane growing near millet grass [? *Setaria italica*] in creeks and wet patches. It is suggested that Uba might be planted to protect superior but less resistant varieties from direct contact with millet grass. Secondary infection by mosaic was also very severe (up to 50 per cent.) on mountain spurs, especially on those with a southerly aspect. The planting of Q. 813 is recommended on these situations, as this cane is much more resistant to mosaic than any other variety in common use locally and is also very resistant to gumming.

Disease control in Hawaii. Eye spot and mosaic reduced in past year by control measures.—*Facts about Sugar*, xxiii, 28, p. 657, 1928.

A report from Honolulu dated 18th June, 1928, indicates that effective measures are in progress for the control of two common Hawaiian sugar-cane diseases, viz., mosaic and eye spot [*Helminthosporium sacchari*: *R.A.M.*, vii, p. 536]. The incidence of infection by eye spot on the island of Kauai during the past season is estimated at only a fraction of that recorded in the previous year. Satisfactory data have also been received from the Waialua Agricultural Company, Oahu. Among the many new seedlings which are being tested for resistance to *H. sacchari* may be mentioned U.D. 1 and Wailuku 2.

A marked decline in the prevalence of mosaic in the Kohala and Hamakua districts has also been observed, largely owing to the replacement of the susceptible Tip varieties by Yellow Caledonia and D. 1135.

STEWART (G. R.). **Report on chemistry.**—*Proc. Hawaiian Sugar Planters Assoc., 47th Ann. Meeting 1927*, pp. 134–151, 1928. [Abs. in *Chem. Abstracts*, xxii, 19, pp. 3719–3720, 1928.]

Soils from small areas where the H. 109 variety of sugar-cane suffered from acute root failure [*R.A.M.*, vii, p. 474] were found to contain more replaceable magnesium than the adjacent fertile soils, and pot tests indicated that this excess may be partly responsible for the disease. Growth failure of Lahaina cane at Waipio could not be traced to the presence of injurious salts, toxic acidity, or deficiencies of plant nutrients in the soil, but comparative studies of the composition of good and poor canes showed a higher per-

centage of K_2O and a lower proportion of SiO_2 in the former. Spectroscopic examinations of the ash of both types of cane revealed the presence of minute amounts of boron and lead in the good ones, while these elements were almost entirely absent in the affected canes. The oxidizing power of soils from healthy fields was found to be higher than that of those from diseased areas. Evidence was obtained indicating that this is partly due to the presence of manganese in the form of MnO_2 in larger quantities in the good soils. The ash of H. 109 canes affected by eye spot [*Helminthosporium sacchari*: see preceding abstract] was found to contain small quantities of zinc, which was almost completely absent from healthy individuals. Soils on which eye spot was prevalent were markedly deficient in available P_2O_5. Applications of sulphur at the rate of 1,000 to 2,000 lb. per acre gave effective control of Pahala blight [ibid., vii, p. 271]. These quantities may be safely used on neutral or slightly alkaline soils, but care should be taken in applying sulphur to acid soils.

FAWCETT (G. L.). **The white spots on the Sugar Cane leaves.**—*Planter and Sugar Manufacturer*, lxxx, 14, pp. 263–264, 1928.

During the winters of 1925–27 more or less symmetrically distributed white spots appeared on the leaves of sugar-cane growing near Tucumán, Argentine; experiments [which are briefly described] showed them to be due to exposure of the cane to low temperature [cold chlorosis: *R.A.M.*, vi, p. 184], which, however, was not low enough to kill the terminal shoots. The spots appeared in corresponding positions on neighbouring canes and their distance apart on each leaf was approximately equal, indicating that the cause acted at the same moment on the different leaves. The matter is considered to have no economic importance.

DOBROZRAKOVA (Mme T. L.). **Новости местной микофлоры.** [Novelties of the local mycoflora.]—*Morbi Plantarum*, Leningrad, xvi, 3–4, pp. 197–204, 1 pl., 1 fig., 1927. [Received August, 1928.]

In this paper brief descriptions with Latin diagnoses are given of one new genus and eleven new species of fungi, mostly of no economic importance, recorded in the neighbourhood of Leningrad. The new genus *Naumovia* belongs to the family Cucurbitariaceae Scolecosporeae. The type species, *N. abundans*, was found parasitizing all the aerial parts, the stolons, and occasionally the roots of *Brunella vulgaris*, on which it forms superficial, firm, well-delimited stromata of a fleshy-ligneous consistency, at first immersed, then erumpent through a longitudinal crack, bearing numerous aggregated, spherical, black perithecia from 225 to 350 μ in diameter. The asci are greenish in mass, cylindrical, with a short pedicel, and measure 67 to 97 by 4·5 to 7·5 μ. The spores are biseriate, filiform, pointed at both ends, usually slightly bent, subhyaline, with 1 to 6 septa, and measure 30 to 39·5 by 1·5 to 3 μ.

Ophiobolus sarmentorum was found on dry bines of hops (*Humulus lupulus*). It is characterized by solitary, glabrous, black, conical

perithecia, measuring 450 by 360 μ. The asci are cylindrical, tapering towards the apex, and 150 to 217 by 4·6 μ in diameter. The spores are filiform, of the same length as the asci, 1·5 μ thick, multiseptate, and of a yellowish-green colour in mass. These characters are compared in a table with those of the other species of *Ophiobolus* that are known to occur on hops.

LOBIK (A. I.). Материалы к микологической флоре плавень реки Кумы по обследованиям **1925** года. [Contribution to the mycological flora of the marshy banks of the river Kuma according to the investigations of 1925.]—*Материалы по флористическим и фаунистическим обследованиям Терского округа* [*Materials provided by the floristic and faunistic investigations of the Terek Region*], *1928*, Pyatigorsk, pp. 13–61, 5 pl., 1928. [French summary.]

This is a descriptive list of 130 species of fungi, including many parasitic forms, which were collected in 1925 on the marshes along the river Kuma [North Caucasus]. Some 50 new species are described, none of which, however, attacked plants of economic importance.

TUNSTALL (A. C.). **Cold weather spraying.**—*Quart. Journ. Indian Tea Assoc., 1928*, 2, pp. 99–105, 1928.

This paper contains some general directions for the control of fungous diseases of tea in north-west India by systematic spraying. Details of the manufacture and application of the Bordeaux mixture and lime-sulphur solutions recommended for this purpose have already been given [*R.A.M.*, vi, p. 515].

PURDY (HELEN A.). **Immunologic reactions with Tobacco mosaic virus.**—*Proc. Soc. Exper. Biol. and Med.*, xxv, 8, pp. 702–703, 1928.

In a study of the immunological reactions with a tobacco mosaic virus to an antiserum from rabbits, antisera were produced separately by intravenous injections of rabbits with sap extracted from healthy Turkish tobacco plants, and sap from plants affected by mosaic. In several series of alexin-fixation tests, each antiserum was titrated with its homologous and heterologous antigen, the higher titre for a given antiserum being obtained with the former. These results agree with those of Dvorak's experiments on healthy and mosaic potatoes [*R.A.M.*, vii, p. 192]. Precipitin-absorption tests further demonstrated the presence of a highly specific precipitin in the antiserum to virus sap. The preventive action of specific antiserum on virus sap *in vitro* was shown by the inability of antiserum-virus mixtures, kept at room temperatures for several hours, to induce mosaic on inoculation into healthy tobacco plants. This preventive action was not exerted by normal rabbit serum and antiserum to healthy tobacco sap. Fresh antiserum to virus sap exerted a stronger inhibitive action than the same inactivated by 30 minutes' heating at 56° C. Heated antiserum could, however, be reactivated by the addition of fresh rabbit or guinea-pig serum.

JONES (P. M.). **Parasite Calkinsi on Plasmodiophora tabaci and its possible etiological rôle in Tobacco mosaic.**—*Arch. für Protistenkunde*, lxii, 2–3, pp. 307–311, 4 pl., 1928.

The occurrence of both *Plasmodiophora tabaci* and a parasite which has been termed *Calkinsi*. of unknown affinity, in the cells of mosaic tobacco plants is considered to raise the question of the possible relations of either or both these organisms in the etiology of the disease [*R.A.M.*, vi, p. 324].

Calkinsi was found in all the 450 diseased plants studied and in none of the 300 healthy ones. *P. tabaci* and tobacco are both hosts of *Calkinsi*, which has a symbiotic relationship to the former, opening the way into the plant for *P. tabaci*, which in return protects the parasite by forming a cyst wall round it during unfavourable conditions *P. tabaci* is apparently unable to penetrate the host cell wall without the help of *Calkinsi*, but once it enters both the host cell and the plasmodium increase in size, and the wall of the former thickens while its cytoplasm is being exhausted. Cyst spores are formed by *P. tabaci* when all the food is used up. Under favourable conditions the spores are extruded, but in adverse circumstances they are formed within the plasmodium and are transported with the latter. *P. tabaci* invades the sieve-tubes and reaches all parts of the plant. When the nuclei of the plasmodium undergo division by promitosis they become very transparent and will not take the stain, so that their identification in young plants is very difficult.

Calkinsi can be seen in the living condition only when there are hundreds moving violently within the sporoblast. The parasite, which measures about 1 by 1·5 μ, is capable of contracting into a ball. It attacks the nucleus of the host plant, in the meristematic tissue of which it is chiefly found. Possibly *Calkinsi* is identical with Miss Eckerson's organism in tomato plants [ibid., v, p. 523], but the details which she describes have not been recognized.

PATEFF (P.). **Wildfire a new Tobacco disease in Bulgaria.**—*Bull. Soc. Bot. de Bulgarie*, ii, pp. 39–42, 1928.

This is a reproduction of the English summary appended to the author's paper on tobacco wildfire (*Bacterium tabacum*) in Bulgaria, which has been noticed from another source [*R.A.M.*, vii, p. 548].

JONES (J. P.). **Influence of cropping systems on root rots of Tobacco.**—*Journ. Amer. Soc. Agron.*, xx, 7, pp. 679–685, 1928.

Experiments were instituted at the Massachusetts Agricultural Experiment Station in 1923 to determine the effects of different cropping systems on tobacco. The experiments were conducted on a fine sandy loam soil typical of many of the tobacco-growing areas in the Connecticut Valley. Two types of rotation were included in the scheme, viz., hay, tobacco, and maize; and onions, tobacco, and potatoes. Five methods of continuous tobacco culture were also tested, namely, (1) with fertilizer only (a 5–4–5 mixture of NH_3, P_2O_5, and K_2O); (2) fertilizer and farmyard manure (9 tons per acre); (3), (4), and (5) fertilizer and timothy [*Phleum pratense*], rye, and redtop [*Agrostis alba*] cover crops, respectively.

Black root rot [*Thielavia basicola*] occurred only in a mild form and to a slight extent under the conditions of these experiments.

even where lime (1 ton per acre) was applied to the onion crop. The soil on which the tests were conducted was very acid (P_H 5 to 5·6), and it has been shown by Anderson and his collaborators [*R.A.M.*, vii, p. 280] that the disease is never severe in such soils. The resistant strain of tobacco 142 A 3 X yielded 1,799 lb. per acre after onions in 1927, as compared with 1,426 lb. for the ordinary Havana seed-tobacco.

On the other hand, brown root rot [ibid., vi, p. 381] varied with the cropping systems, occurring most severely on tobacco in the first type of rotation. The disease was also prevalent after a timothy cover crop and after both maize and hay, but slightly less so following potatoes. Brown root rot is the only tobacco trouble associated with the first type of rotation and following potatoes, so that the success of the crop in these systems depends on a better knowledge of this disease. Very little brown root rot was observed where tobacco was grown after onions or in continuous culture without a cover crop. The superior yields obtained in these plots are attributed chiefly to the absence of this disease, since the other conditions were comparable.

Contrary to a widespread opinion, these experiments confirm the conclusion that timothy has no significant effect on the incidence of *T. basicola,* while instead of reducing the amount of brown root rot, timothy has increased its extent and severity [loc. cit.].

Both black and brown root rot appear to be influenced by climatic or seasonal factors, since decided variations were observed in different years with the same treatment.

WHITE (R. P.). **Tomato wilt disease.**—*Kansas Agric. Exper. Stat. Circ.* 140, 5 pp., 2 figs., 1928.

Tomato wilt, caused by *Fusarium lycopersici* [*R.A.M.*, vii, p. 750], is stated to have spread rapidly of recent years in Kansas, where it now occurs throughout nearly the whole south-eastern quarter of the State, and where the annual loss caused by it through reduced yield and impaired quality has increased from a fraction of 1 per cent. in 1918 to at least 10 per cent. in 1926.

During seven years' investigations at the Kansas Agricultural Experiment Station the most resistant commercial varieties adapted to local conditions were found to be Louisiana Red, Louisiana Pink, Marvel, Norton, Norduke, Marvana, and Marglobe. The most resistant of these was Louisiana Pink, closely followed by Louisiana Red and Norton, while the earliest was Marvana, followed by Marvel and Louisiana Red [ibid., v, p. 455].

A new variety, Kanora, produced at the Station, is a selection from a cross between Norton and John Baer made in 1921, since when the strain has passed through eight generations, and has proved both wilt-resistant and of higher yield than any other variety tested. The fruit is stated to be medium early, and excellent for canning and shipping.

LUDWIGS (K.). **Behandlung von Tomatenstauden mit Uspulun.** [Treatment of Tomato plants with uspulun.]—*Obst- und Gemüsebau*, lxxiv, 7, p. 109, 1928.

Further details are given of the writer's experiments in the

control of tomato canker [*Didymella lycopersici*: *R.A.M.*, vii, p. 283]. Good results were given in the greenhouse by soil disinfection with carbon disulphide applied at the rate of 5 c.c. per sq. m. at a depth of 10 cm.; uspulun dust (50 gm. per sq. m.); and liquid uspulun (5 l. of the 0·25 per cent. solution per sq. m.). Formaldehyde applied at the same rate as uspulun was less satisfactory. Outdoor plants were successfully treated by the immersion of their roots, previous to planting, in a 0·25 per cent. solution of uspulun: during the first few weeks after planting two applications of the same solution were given to the stem bases. Attention is again drawn to the undesirability of uspulun for the treatment of the leaves and fruit owing to the unpleasant flavour which it imparts.

UPHOF (J. C. T.). **Zur Frage der Ulmenkrankheit in Europa.** [On the question of the Elm disease in Europe.]—*Zeitschr. für Pflanzenkrankh. u. Pflanzenschutz*, xxxviii, 7–8, pp. 222–224, 1928.

The theory is advanced that the die-back of elms, now widespread in Europe [*R.A.M.*, vii, pp. 680, 681], may be due to some organism which occurs in a saprophytic or mildly parasitic form on certain of the exotic species recently introduced from other continents. An analogous case is the chestnut (*Castanea dentata*) blight (*Endothia parasitica*), which is relatively innocuous to *C. mollissima* in China, apparently its original home. Harrer's recent observation of the extensive die-back of edible chestnuts [*C. sativa*] at Cronberg (Taunus) [ibid., vii, p. 353] is cited, but in a foot-note to this paper v. Tubeuf states that *E. parasitica* was not present in the diseased material submitted to him for examination.

PILÁT (A.). **Xanthochrous cuticularis (Bull.) Patouillard, nový choroš pro Čechy a Moravu.** [*Xanthochrous cuticularis* (Bull.) Patouillard, a Polypore new to Bohemia and Moravia.]—*Mykologia*, Prague, iii, 9–10, pp. 120–122, 2 figs., 1926. [French summary. Received September, 1928.]

A brief morphological description is given of *Xanthochrous cuticularis* (*Polyporus cuticularis* (Bull.) Fr.), a rare polypore which was found in 1926 for the first time in Bohemia on an oak stump and in Moravia on an elm stump. Attention is called to this discovery since in central Europe this fungus has been occasionally found to cause a rot of living deciduous trees, chiefly oaks, beeches, elms, and maples. The wood rot caused by it is whitish with rusty margins, very similar to that caused by *X.* [*P.*] *hispidus* in apple trees [*R.A.M.*, iii, 497; iv, p. 446].

PILÁT (A.). **Trametes pini (Brot.) Fries.—choroš borový, nebezpečny škůdce jehličnatých lesů.** [*Trametes pini* (Brot.) Fries, a dangerous parasite of coniferous forests.]—*Mykologia*, Prague, iii, 1, pp. 7–9, 1 pl., 1 fig., 1926. [Received September, 1928.]

Trametes pini [*R.A.M.*, vi, p. 700] is stated to occur to some extent, chiefly on *Pinus sylvestris* but occasionally also on some other conifers, in the forests of Czecho-Slovakia, and the author

stresses the necessity of its prompt eradication before it has increased to the same disastrous extent as in certain other European countries, e.g., in the north of Germany. After a brief description of the morphology of the fungus, he outlines its geographical distribution and gives a list of the coniferous trees on which it has been recorded. Control measures should consist in the removal and destruction of all infected material from the forests, and in the avoidance of injuries to the green branches and to the bark of the trees.

VAKIN (A. T.). **Die Herzfäule der Fichte in den Revieren des Rshevsky Forstes in Gouvernement Tver.** [Heart rot of Spruce in the Rshevsky forest domains in the Tver government.]—*Mitt. Leningrad Forstinst.*, xxxv, pp. 105–154, 1927. [Russian, with German summary. Abs. in *Bot. Centralbl.*, N.F., xvi, 3–4, pp. 118–119, 1928.]

Heart rot of spruce in the region in question is stated to be caused mainly by *Fomes annosus* and *Trametes abietis*, while *F. pinicola* and *Polyporus* [*Daedalea*] *borealis* are also sometimes involved [*R.A.M.*, vi, p. 201]. The disease frequently develops as a sequel to injuries to the roots and trunks. Even in the incipient stages of decay the hyphae of undetermined fungi are active in the destruction and dissolution of the cell membranes.

FISCHER (E.). **Über weitere Versuche mit dem auf Juniperus phoenicea auftretenden Gymnosporangium confusum.** [On further experiments with *Gymnosporangium confusum* occurring on *Juniperus phoenicea*.]—Reprinted from *Mitt. Naturforsch. Gesellsch. Bern.*, *1928*, 1 p., 1928.

Crataegus [*oxyacantha*] and *Cydonia maliformis* were successfully inoculated with teleutospores of *Gymnosporangium confusum* isolated from *Juniperus phoenicea* at Sanary [near Toulon] [*R.A.M.*, vii, p. 417]. Aecidia developed in profusion on the first-named host but were only observed in one case on *C. maliformis*. In contradistinction to the strain of *G. confusum* occurring on *J. sabina*, that from *J. phoenicea* injures the *Cydonia* leaves to such an extent (causing widespread discoloration and necrosis) that the complete evolution of the fungus becomes impossible.

Several explanations of this phenomenon are suggested. The *Cydonia* leaves may have been weakened by forcing previous to inoculation, or they may possess an extreme degree of natural susceptibility to the parasite. On the other hand, the strain of *G. confusum* on *J. phoenicea* may be inherently more virulent in its action on *C. maliformis* than that occurring on *J. sabina*.

DETWILER (S. B.). **Developments in White Pine blister rust control in the United States.**—*Journ. Econ. Entomol.*, xxi, 3, pp. 476–484, 1928.

In this paper the author gives a brief review of the history of the introduction and spread of the white pine blister rust [*Cronartium ribicola*] in the different regions of the United States where white

pines are of economic importance, and also summarizes the present control situation from its regulatory aspect [see below, p. 815]. It is stated that the rust was found for the first time in 1927 in Idaho and in the south-eastern portion of British Columbia near the Montana border. These infections were found only on species of *Ribes*, but the disease is known to occur on pines over a large area in eastern British Columbia. The long-distance spread of the rust from infected pines to the cultivated black currant (*Ribes nigrum*) was again proved in 1927, when the rust was found on that host north of Prince George at a distance of 350 miles north of the established range of five-leaved pines.

The general aim of white pine blister rust control is stated to be the systematic local segregation of five-leaved pines and species of *Ribes* on areas best suited to their respective cultivation, but the cultivated black currant is being generally eradicated because of its high susceptibility to infection, great pine-infecting power, and small economic importance in the United States. Some figures are given regarding the cost in different States of the local control campaign and the progress so far achieved. Data on the ecology of species of *Ribes* indicate clearly that permanent and effective suppression of these plants can be secured to a very large degree through practicable methods of forest management. About 60 per cent. of the western forests containing white pines are free from *Ribes*. An important point that was established in control experiments in the western States is that *R. petiolare*—a susceptible species growing abundantly in some localities—can be readily and completely destroyed by spraying the foliage with a solution of sodium chlorate, and further trials are in hand to render the solution effective against other species of *Ribes*, to decrease the cost of the treatment, and to improve the efficiency of the spraying machinery.

It is recommended that nurserymen should grow their stocks of white pine from seed in areas from which all *R. nigrum* bushes are absent within a radius of at least one mile [that being beyond the limit from which infection can ordinarily pass from black currant to pine], and in which no *Ribes* plants of any species are present within 1,500 feet of the seed-beds and transplanted stock.

Boyce (J. S.). **A possible alternate stage of Pucciniastrum myrtilli (Schum.) Arth.**—*Phytopath.*, xviii, 7, pp. 623–625, 1928.

Circumstantial evidence is presented supporting the existence of a genetic connexion between an undetermined species of *Peridermium* found on Mt. Hood, Oregon, on the previous season's needles of the Pacific silver fir (*Abies amabilis*) and *Pucciniastrum myrtilli* on *Vaccinium macrophyllum* and *V. ovalifolium* which was always found in immediate proximity to the infected firs. Inoculation experiments have so far given negative results, but the available data show that the *Peridermium* in question differs from all other species found on Mt. Hood, and are thought to justify its provisional identification as the aecidial stage of *Pucciniastrum myrtilli*.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, ii, 1, pp. 35–44, 1928.

AUSTRIA. A Federal Decree, effective as from 23rd November, 1927 (*Bundesgesetzblatt*, 87, p. 1307, 1927), defines the regulations obtaining in Carinthia, Upper Austria, Salzburg, Styria, and Vorarlberg in respect of potato wart disease [*Synchytrium endobioticum*: *R.A.M.*, vii, p. 664]. The most stringent measures have been adopted to check the spread of the disease, and to ensure the exclusive use of immune varieties on infested soil.

SWEDEN. A modification in the provisions governing the importation of living plants into Sweden (2nd March, 1928) dispenses with the obligation of dispatching the goods direct from the place of cultivation, on condition that they are accompanied by a duly authenticated certificate vouching for their freedom from any contact with potato wart disease.

SOVIET RUSSIA. As from 15th February, 1927, all vines and parts thereof imported into Soviet Russia must be accompanied by a duly authenticated certificate guaranteeing their entire freedom from fungous diseases and insect pests.

Legislative and administrative measures. Italy.—*Internat. Rev. of Agric.*, N.S., xix, 7, p. 656, 1928.

A Ministerial Decree of 10th September, 1927, extends to the Italian colonies of Tripolitania and Cyrenaica the regulations regarding the importation into Italy of vines, chestnuts, potatoes, and various kinds of fruit, the details of which have already been published [*R.A.M.*, vi, pp. 639–640].

Legislative and administrative measures. French Protectorate of Morocco.—*Internat. Rev. of Agric.*, N.S., xix, 7, pp. 657–658, 1928.

A Decree of 1st June, 1928, defines as follows the plant parasites against which crops and plantations in the French zone of the Sherifian Empire should be protected: *Synchytrium endobioticum* on potatoes and *Phytomonas* [*Pseudomonas*] *citri* on citrus [*R.A.M.*, vii, p. 752].

White-Pine blister-rust quarantine regulations revised.—*U.S. Dept. of Agric., Plant Quarantine and Control Admin. Leaflet*, 6 pp., 1928.

As a result of investigations conducted by the Bureau of Plant Industry, and of changes in the white pine blister rust (*Cronartium ribicola*) situation during the last two years, the existing quarantine regulations concerning this disease have been revised as from 31st July, 1928 [*R.A.M.*, vii, p. 480, and above, p. 814]. Provision is now made for the inter-State movement, under permit, of five-leaved pines from the generally infected areas, comprising the New England States, New York, and the State of Washington, into the less heavily infected States east of the Mississippi Valley quarantine line [ibid., vi, p. 64], and also from Washington into Oregon and Idaho, when they have been raised from seed in a nursery free from currant and gooseberry plants and with a *Ribes*-free zone

round the premises; the prohibition of movement from Wisconsin and Minnesota to Michigan, Pennsylvania, and New Jersey is removed; and the inter-State shipment of cultivated red, white, and mountain (*R. alpinum*) currant, and gooseberry plants, from infected States is authorized without restriction, provided they have been dipped in lime-sulphur solution of a specified strength, maintain the required conditions as to dormancy and defoliation, and are shipped within the prescribed period.

SCHLUMBERGER [O.]. **Saatenanerkennung und Pflanzenkrankheiten im Jahre 1927.** [Seed certification and plant diseases in the year 1927.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, viii, 7, pp. 59–61, 1928.

The work of seed certification in Germany during 1927 was conducted on the usual lines [*R.A.M.*, vii, p. 44]. For the first time statistics for a five-year period 1922 to 1926 are available for comparative purposes.

Of the entire area inspected during 1927, comprising more than 167,929 hect., certification was refused over 22,677 hect., or 13·75 per cent. The total percentage of disease among the various crops was as follows: rye 8·3 (as against an average of 2·8 from 1922 to 1926); wheat 15·7 (46·3); barley 30 (33·6); oats 12·4 (34·7); and potatoes 45·5 (70·7). The percentage distribution of individual diseases was as follows: bunt of wheat [*Tilletia tritici* and *T. levis*] 1 (compared with 4·8 from 1922 to 1926); loose smut of wheat [*Ustilago tritici*] 0·6 (2·3); loose and covered smuts of barley [*U. nuda* and *U. hordei*] 4·3 (3·1); loose smut of oats [*U. avenae*] 1·3 (3·8); and flag smut of rye [*Urocystis occulta*] 0·02 (0·059).

An area covering approximately 3,310·7 hect. under potatoes was refused certification on account of disease in 1927, compared with 3,758·8 hect. in 1926.

Reglamento para la inspección de insecticidas, fungicidas y demás productos destinados al combate de las plagas y enfermedades de los vegetales. [Regulations for the inspection of insecticides, fungicides, and other products destined for the control of pests and diseases of plants.]—*Bol. Mens. Ofic. Def. Agric. Estados Unidos Mexicanos*, ii, 6–7, pp. 304–307, 1928.

The new regulations governing the inspection of plant protectives in Mexico (*Diario Oficial*, xlviii, 26, 1st June, 1928) are outlined. The functions of the Federal Office of Agricultural Defence consist, *inter alia*, in the issue of certificates guaranteeing the efficacy of insecticides, fungicides, and similar industrial products destined for the control of plant diseases and pests; the provision of the necessary areas for experimentation and of expert technical service for the testing of such products, for which purposes the establishment of a Chemical and Biological Laboratory and of experiment stations, in affiliation with the Office of Agricultural Defence, is authorized. The results of these trials are to be published in the *Bulletin* of the above-mentioned body, the staff of which will also give advice on the application of control measures and other related matters. Further details concerning the administration of these regulations are given.

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PRINTED IN GREAT BRITAIN AT THE UNIVERSITY PRESS, OXFORD
BY JOHN JOHNSON, PRINTER TO THE UNIVERSITY